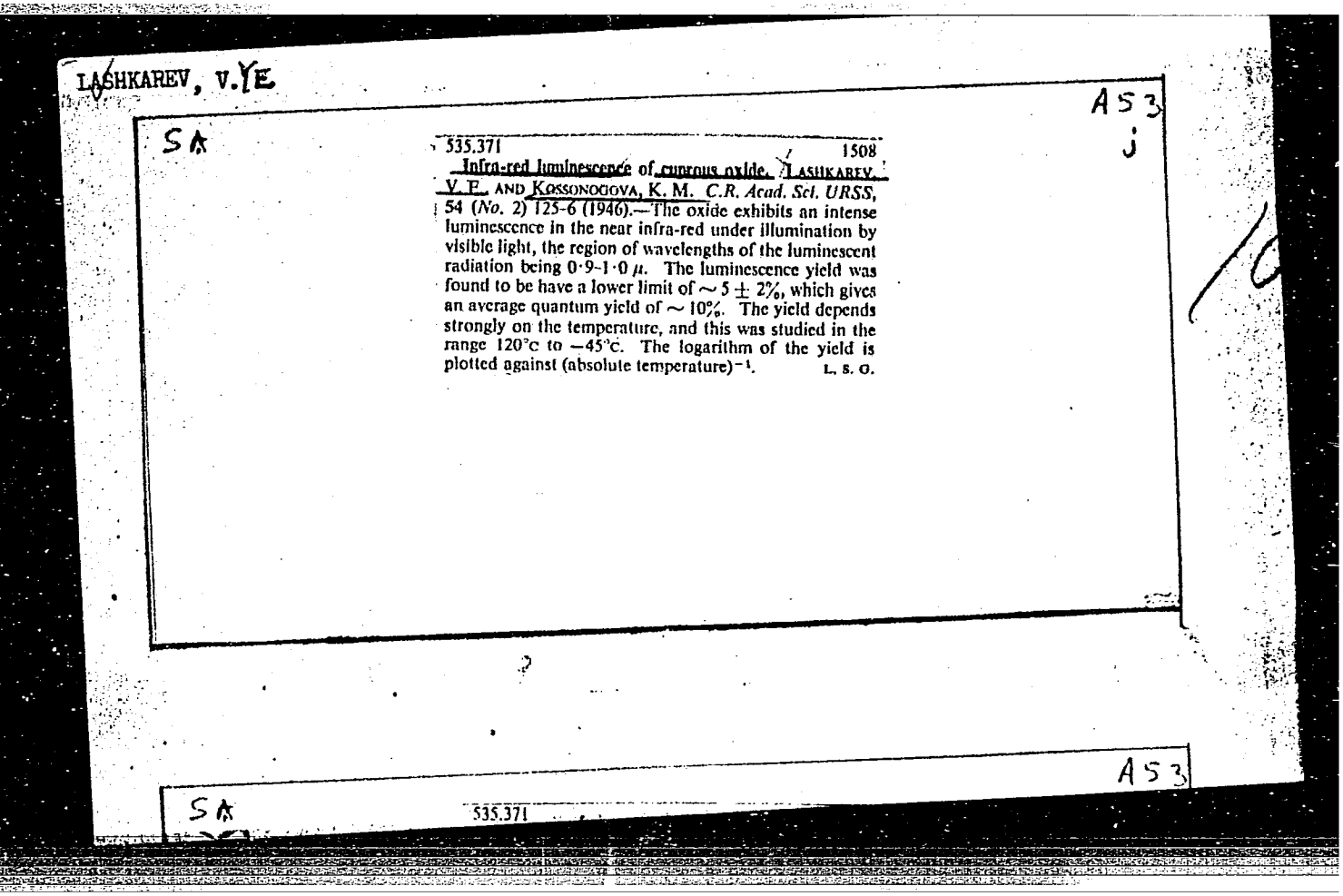


LASHKAREV, V.YE

SA

A53

j

535.371 1508

Infra-red luminescence of cuprous oxide. LASHKAREV, V. E. AND KOSSONOGOVA, K. M. *C.R. Acad. Sci. URSS*, 54 (*No.* 2) 125-6 (1946).—The oxide exhibits an intense luminescence in the near infra-red under illumination by visible light, the region of wavelengths of the luminescent radiation being 0·9-1·0 μ. The luminescence yield was found to be have a lower limit of $\sim 5 \pm 2\%$, which gives an average quantum yield of $\sim 10\%$. The yield depends strongly on the temperature, and this was studied in the range 120°c to −45°c. The logarithm of the yield is plotted against (absolute temperature)$^{-1}$. L. S. G.

A53

SA

535.371

LASHKAREV, V. YE.

PA 19/49T97

USSR/Physics Oct 48
Conductors, Semi-
Photoelectromotive Force

"The Appearance of Photoelectromotive Forces in Semiconductors," V. Ye. Lashkarev, Phys Inst, Acad Sci Ukrainian SSR, 10 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 10 pp 917-20.

Works out theory for development of photoelectromotive forces (photo emfs) in semiconductors with dark conductivity due to bearers of one sign. Studies effect of precontact electric fields. Suggests that photoelectrons and photo holes lose excess energy extremely rapidly.

19/49T97

USSR/Physics (Contd) Oct 48

Completes calculations for case of weak illumination. Shows that sign of photo emf is completely determined by sign of precontact field and sign of dark current bearers. Calculates photomagnetic effect using same theory. Finds relation between photoelectron concentrations and excess holes. Submitted 13 May 48

19/49T97

LASHKAREV, V. YE.

PA 19/49198

USSR/Physics
Photoelectromotive Force
Conductors, Semi-

Oct 48

"Photoelectromotive Forces in Cuprous Oxide," V. Ye. Lashkarev, K. M. Kosmogova, Phys Inst, Acad Sci Ukrainian SSR, 9½ pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 10 pp 927-36.

Shows that photo emf is completely determined by conditions of metal-semiconductor contact. Shows qualitative agreement of results with those indicated by theory developed by Lashkarev (see 18/49T105). Investigates spectrum distribution of positive

19/49198

USSR/Physics (Contd)

Oct 48

and negative photo emfs in cuprous oxide. Interprets results. Submitted 13 May 48.

19/49198

USSR/Electronics
Photoconductivity
Photoelectricity

Nov 48

"'Longitudinal' Photoconductivity and Photoelectric EMF in Copper Oxide," V. Ye. Lashkarev, K. M. Kosonogova, Inst of Phys, Acad Sci Ukrainian SSR, 8 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 11 pp 993-61.

Studied photoconductivity of Cu_2O with lighting through a semitransparent electrode, i.e., along the electric field ("longitudinal" photoconductivity). Investigated specimens yielding (+) photoelectromotive force. Showed photoconductivity may be separated into two parts, controlled and uncontrolled field. Showed presence of a saturation current for the controlled section. Submitted 13 May 48.

51/49T21

LASHKAREV, V. Ye.

USSR/Electronics Nov 48
Photoconductivity
Semiconductors

"Longitudinal' Photoconductivity of Semiconductors," V. Ye. Lashkarev, Inst of Phys, Acad Sci Ukrainian SSR, 9 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 11 pp 982-9

Discusses, in the linear approximation, photoconductivity of a "hollow" semiconductor for case when gradient of light and electric field are parallel or antiparallel. Specimen was lighted through a semitransparent electrode. Obtained conclusive

51/49T22

USSR/Electronics (Contd) Nov 48

formulas for case of an antilocking contact film, in whose boundaries light was completely absorbed. Submitted 13 May 48.

51/49T22

LASHKAREV, V. Ye.

LASHKAREV, V. YE.

PA 18/49T105

USSR/Physics
Conductors, Semi-
Photoelectric Cells

Nov 48

"Properties of Poor Conductor Layers Between Metal and Semiconductors," V. Ye. Lashkarev, Inst of Phys, Acad Sci Ukrainian SSR, Kiev, 9 pp

"Zhur Tekh Fiz" Vol XVIII, No 11, pp 1347-55.

Investigates rectifying and capacitance properties of the molecular layer between metal and semiconductor, and also its role in the origination of photoelectromotive forces. Shows that stated theory depicts correctly all characteristic features of silver sulfide photoelectric cells. Studies

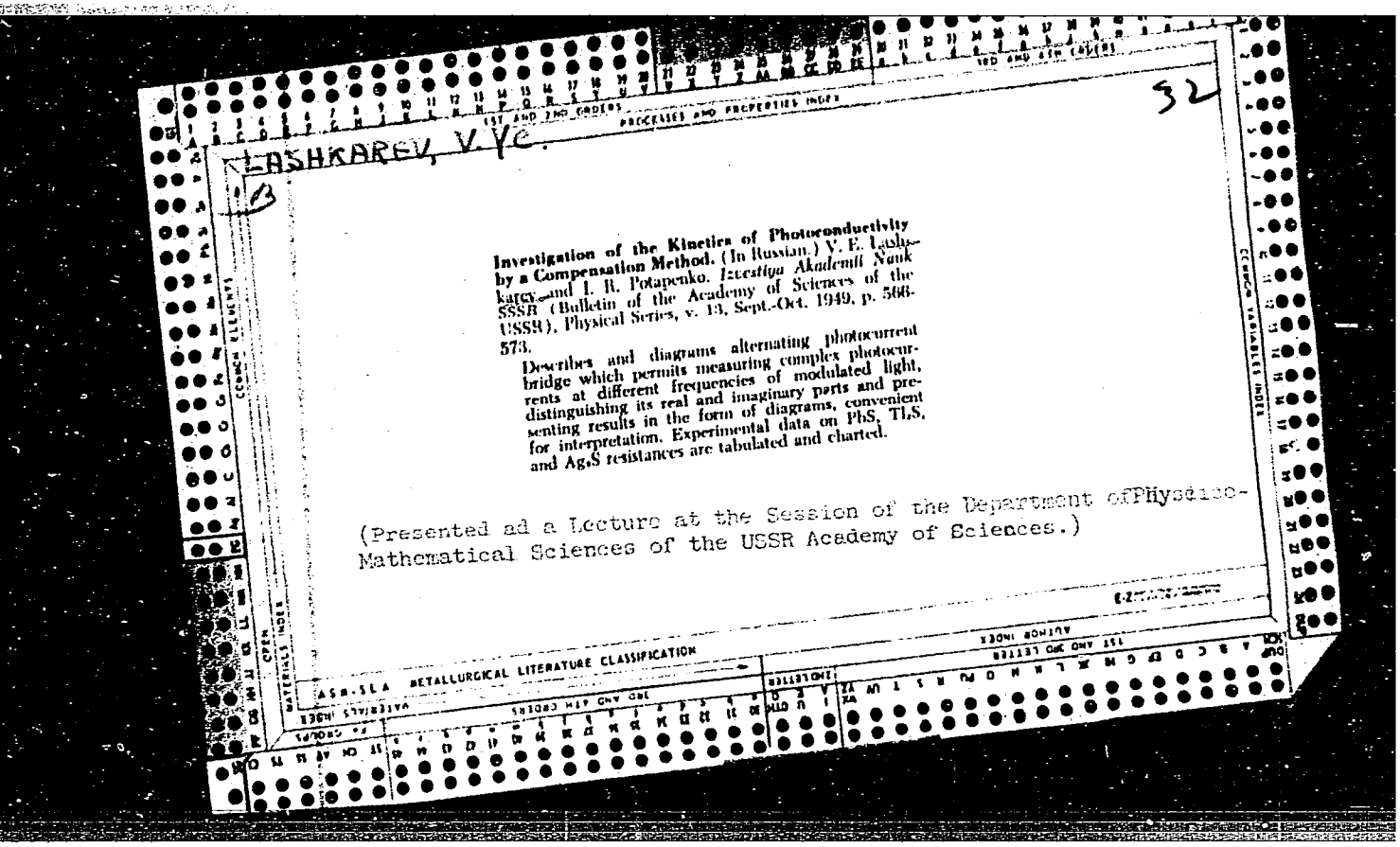
18/49T105

USSR/Physics (Contd)

Nov 48

capacitance properties of isolating layers between metal and semiconductor. Submitted 15 May 48.

18/49T105



LASHKAREV, V. Ye.

32

Investigation of the Kinetics of Photoconductivity by a Compensation Method. (In Russian.) V. E. Lashkarev and I. R. Potapenko. *Izvestiya Akademii Nauk* SSSR (Bulletin of the Academy of Sciences of the USSR), Physical Series, v. 13, Sept.-Oct. 1949, p. 566-573.

Describes and diagrams alternating photocurrent bridge which permits measuring complex photocurrents at different frequencies of modulated light, distinguishing its real and imaginary parts and presenting results in the form of diagrams, convenient for interpretation. Experimental data on PbS, Tl_2S, and Ag_2S resistances are tabulated and charted.

(Presented ad a Lecture at the Session of the Department ofPhysico-Mathematical Sciences of the USSR Academy of Sciences.)

LASHKAREV, V. YE.

PA 150T78

USSR/Physics - Photoconductivity
Semiconductors

Oct 49

"Kinetics of the Photoconductivity of Semiconductors," V. Ye. Lashkarev, Inst of Phys, Acad Sci Ukrainian SSR, Kiev State U. 11 pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 10 pp 876-86.

Discusses methods of studying kinetics of semiconductor photoconductivity. Substantiates the method of studying nonlinear photoconductivity. Considers possible mechanisms of nonlinear photoconductivity for a number of individual cases and gives qualitative expressions which may be used for comparison with experimental data. Submitted 17 May 49.

150T78

LASHKAREV, V. YE. PA 150T79

USSR/Physics - Photoconductivity Oct 49
Photoresistors

"Nonlinear Photoconductivity of PbS-Photoresistors," V. Ye. Lashkarev, I. R. Potapenko, G. A. Fedorus, Inst of Phys, Acad Sci Ukrainian SSR, 12 pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 10 pp 887-898/

Studied kinetics of photoconductivity of PbS-photoresistors within a wide range of temperatures and illumination. Compared experimental data with theory developed by Lashkarev. Established mechanism of nonlinear photoconductivity kinetics for PbS-photoresistors. Submitted 17 May 49.

[redacted] 150T79

For other information see [redacted]B65230, 25 May 53.

LASHKAREV, V. Ye. PA 25/49T11

USSR/Electricity Jan 49
Photoconductivity
Semiconductors

"Nonlinear Photoconductivity of Cuprous Oxide," V. Ye. Lashkarev, Active Mem, Acad Sci USSR, G. A. Fedorus, Phys Inst, Acad Sci Ukrainian SSR, Kiev, 4 pp

"Dok Ak Nauk SSSR" Vol LXIV, No 2

Studies connection between the nonlinear effect of photoconductivity in semiconductors and the period of the photocurrent carriers. Submitted 19 Nov 48.

[redacted] 25/49T11

LASHKAREV, V. Ye.

PA 160T91

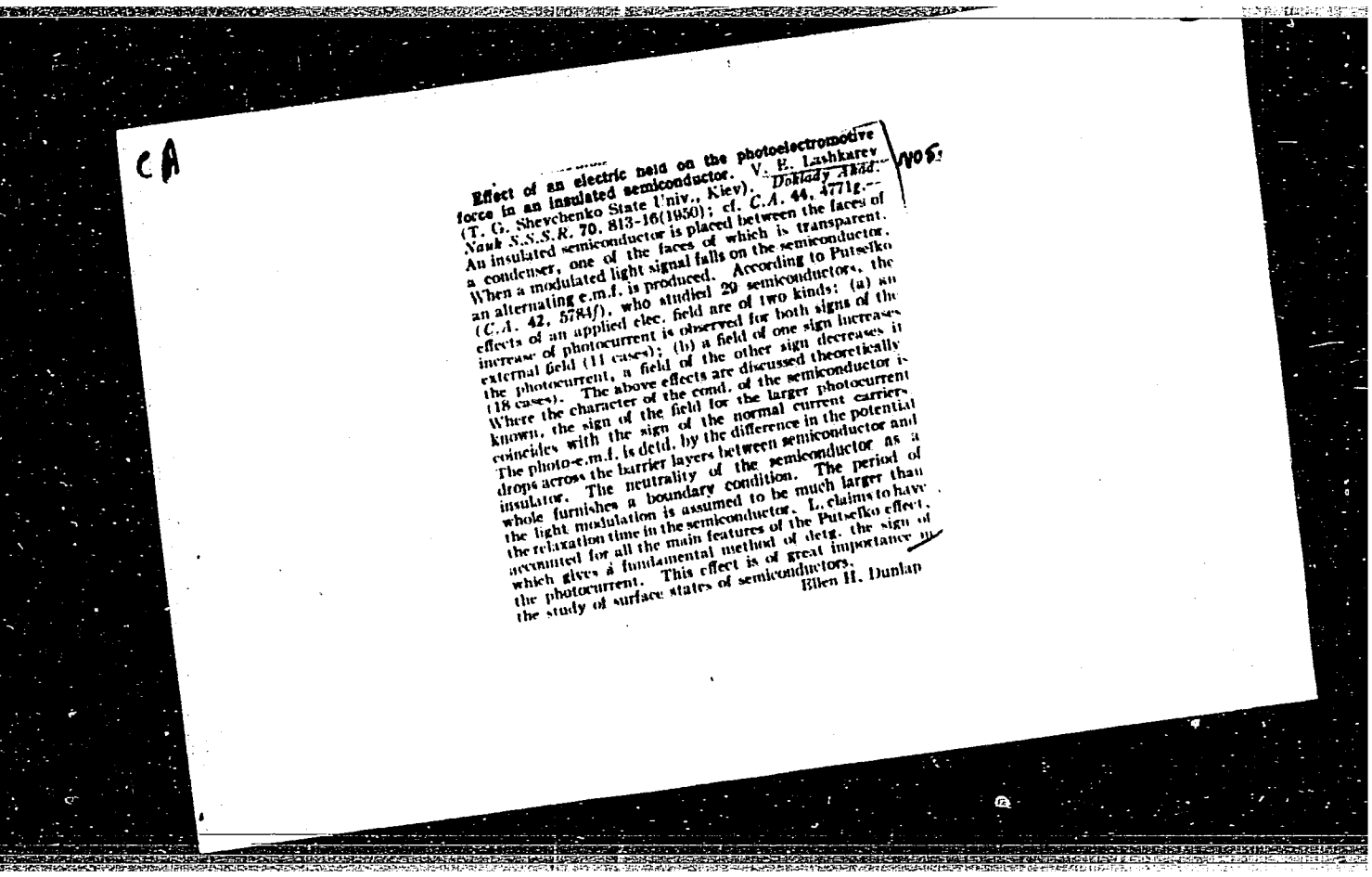
USSR/Physics - Photoconductivity Mar/Apr 50
Semiconductors

"Investigation Into the Kinetics of Photoconductivity of Semiconductors by the Compensation (Bridge) Method," V. Ye. Lashkarev, Inst of Phys, Ukrainian Affiliate, Acad Sci USSR, 13 pp

"Iz Ak Nauk SSSR, Ser Fiz" Vol XIV, No 2 pp 199-211.

Reveals importance of concept of nonlinearity in kinetics of photoconductivity. Concept has been little studied. Mechanism of photoconductivity depends greatly upon certain time-constant RC and upon certain physical quantity "a" (dimensions: amp/time·light intensity) corresponding to Zhuze and Ryvkin's beta.

160T91



CA

Effect of an electric field on the photoelectromotive force in an insulated semiconductor. V. E. Lashkarev (T. G. Shevchenko State Univ., Kiev). *Doklady Akad. Nauk S.S.S.R.* 70, 813-16(1950); cf. *C.A.* 44, 4771g.— An insulated semiconductor is placed between the faces of a condenser, one of the faces of which is transparent. When a modulated light signal falls on the semiconductor, an alternating e.m.f. is produced. According to Putseiko (*C.A.* 42, 5784*f*), who studied 29 semiconductors, the effects of an applied elec. field are of two kinds: (a) an increase of photocurrent is observed for both signs of the external field (11 cases); (b) a field of one sign increases the photocurrent, a field of the other sign decreases it (18 cases). The above effects are discussed theoretically. Where the character of the cond. of the semiconductor is known, the sign of the field for the larger photocurrent coincides with the sign of the normal current carriers. The photo-e.m.f. is detd. by the difference in the potential drops across the barrier layers between semiconductor and insulator. The neutrality of the semiconductor as a whole furnishes a boundary condition. The period of the light modulation is assumed to be much larger than the relaxation time in the semiconductor. L. claims to have accounted for all the main features of the Putseiko effect, which gives a fundamental method of detg. the sign of the photocurrent. This effect is of great importance in the study of surface states of semiconductors.

Ellen H. Dunlap

LASHKAREV, V. A. PA 175T98

USSR/Physics - Semiconductors 11 Aug 50

"Diffusion of Currents in Semiconductors With Composite Conductivity," V. A. Lashkarev, Act Mem, Acad Sci Ukrainian SSR Inst Phys, Acad Sci Ukrainian SSR

"Dok Ak Nauk SSSR" Vol LXXIII, No 5, pp 929-932

Discusses case where other excitations beside thermal ones are absent and finds conditions governing appearance of T-equil. Considers semi-infinite homogeneous conductor with concn of "holes" and electrons n and N resp; differential eq are set up relating n, N, dj/dx (gradient of current density), dy/dx (elec fld strength). Submitted 18 May 50.

175T98

TYABLIKOV, S.V.; LASHKAR'OV, V.Ye., diysnyy chlen.

Energy spectrum of electrons in ionized crystals (weak link theory). Dop.AN URSR no.4:239-242 '51. (MLRA 6:9)

1. Akademiya nauk Ukrayins'koyi RSR (for Lashkar'ov). 2. Matematychnyy instytut im. V.A.Steklova Akademiyi nauk SRSR (for Tyablikov).
(Crystallography)

FAYDYSH, O.M.; KHARYTONOZA, O.P.; LASHKAR'OV, V.Ye., diysnyy chlen.

Stimulation of naphthacene luminescence in solutions. Dop.AN URSR no.5:324-328 '51. (MLRA 6:9)

1. Akademiya nauk Ukrayins'koyi RSR (for Lashkar'ov). 2. Kyyivs'kyy derzhavnyy universytet ta Instytut fizyky Akademiyi nauk Ukrayins'koyi RSR (for Fadysh and Kharytonoza). (Luminescence) (Naphthacene)

LASHKAREV, V. E.

4

Photoconductivity and light absorption in the fundamental band of a [illegible] semiconductor. V. E. Lashkarev. *Pamyati Sergeya Ivanovicha Vavilova, Akad. Nauk S.S.S.R.*, 1952, 324–9.—The article attempts to elucidate the nature of the primary result of absorption of light in the crystal lattice on the basis of recent exptl. data relative to semiconductors, particularly to Cu_2O and to nonactivated monocrystals of CdS. These data were obtained as the result of expts. set up independently of the "exciton" theory of light absorption. Nevertheless they can be used as exptl. proof for this theory, which seems to be the basis for the explanation of the mechanism of light absorption. N. Goldowski

STRASHKEVYCH, O.M.; LASHKAR'OV, V.Ye., diysnyy chlen.

Problem of relativistic electron optics. Dop.AN URSR no.5:393-396 '52.
(MLRA 6:10)

1. Akademiya nauk Ukrayins'koyi RSR (for Lashkar'ov). 2. Chernivets'kyy derzhuniversytet (for Strashkevych).
(Electron optics)

LASHKAREV, V. Ye.

USSR/Physics - Semiconductors Jan/Feb 52

Photoelectromotive Forces in Semiconductors," V. Ye. Lashkarev, Inst of Phys, Acad Sci Ukrainian SSR

"Iz Ak Nauk SSSR, Ser Fiz" Vol XVI, No 1, pp 18-33

Reviews history of development of semiconductors, emphasizing achievements by Soviet physicists. Author recently devoted his studies to modern theory of contact of metal semiconductor and derived a formula for evaluation of the "photomotive" force.

218T84

LASHKAREV, V. Ye.

USSR/Physics - Semiconductors Jan/Feb 52

"Some Peculiarities in the Photoconductivity of CdS Monocrystals," V. Ye. Lashkarev, G. A. Fedorus, Inst of Phys, Acad Sci USSR

"Iz Ak Nauk SSSR, Ser Fiz" Vol XVI, No 1, pp 81-92

Interest in subject was stimulated by work of R. Frerichs (Phys Rev 72, 594, 1947). Author describes his exptl investigations concerning detn of sign of current carriers, relation of photocurrent to illumination, kinetics of inertial component, output of photocurrent, etc. Indebted to A. I. Skopenko.

218T89

USSR/Physics - Semiconductors, Diffusion

Mar/Apr 52

"Diffusion of Current Carriers in Semiconductors With Composite Conductivity," V.Ye. Lashkarev, Inst of Phys, Acad Sci USSR

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, pp 186-201

More detailed exposition of results published by author as "brief communication concerning "Thermal Nonequilibrium" of electrons and holes (cf. "Dok Ak Nauk SSSR" Vol LXXIII, 929, 1950). Attempts to prove theoretically that weak elec fields may produce T-nonequilibrium and sharply change the peculiarities of diffusion. Derives and solves eqs in general and particular cases.

220T91

LASHKAREV, V. Ye.

220T91

LASHKAREV, V. Ye.

USSR/Physics - Semiconductors, Thin-Laminar Mar/Apr 52

"Effect of Volume Charges on Conductivity of Thin Layers of Semiconductors and Metals," M.S. Kosman

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, p 202

Abbreviated text of report published in "Zhur Eksper i Teoret Fiz" 21, 528, 1951. Tested layers were laid on both sides of insulating plate. The sign of effect on semiconductor T_e agrees with theory by V. Ye Lashkarev and with expts by V.I. Lyashenko and I.I.Stepko.

220T93

USSR/Physics - Semiconductors, Mar/Apr 52
Work Function

"Work Function and Conductivity of Semiconductors in Presence of a Surface Charge," V. Ye. Lashkarev, Kiev State U and Inst of Phys, Acad Sci Ukrainian SSSR

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, pp 203-210

Studies effect of surface charge (conception 1st developed by I. Ye. Tamm, Sov. Phys., 1, 733, 1932; "Zhur Eksper i Teoret Fiz" 3, 34, 1933) on work function of a semiconductor. Derives corresponding eqs, showing theoretically that in thin samples

220T94

the distribution of current carriers is homogeneous while in thick or "quasi-thick" layers the surface charges do not produce mutual effect. Exptl research by V.I. Lyashenko (cf. "Zhur Tekh Fiz" Vol XVI, No 2, 211, 1952) is in agreement with this theory.

220T94

LASHKAREV, V. Ye.

LASHKAREV, V. Ye.

USSR/Physics Semiconductors, Surface Charges Mar/Apr 52

"Influence of Adsorption on the Surface Charges and Conductivity of a Semiconductor," V. I. Lyashenko, I. I. Stepko, Inst of Phys, Acad Sci Ukrainian SSR

"Iz Ak Nauk, Ser Fiz" Vol XVI, No 2, pp 211-217

Exptl research methods of the instituto are described by V. Ye. Lashkarev and V. I. Lyashenko in "Jubilee Edition Devoted to 70th Birthday of Academician A. F. Ioffe," 1950. Current article describes study of variation of work function under the influence of various actions on semiconductor; variation of conductivity of thin layer; and study of screening by superficial charges. Indebted to V. Ye. Lashkarev.

PA 220T95

LASHKAREV, V. YE.

USSR/Physics - Photoconductivity 11 Oct 52

"Photoresistances of CdS Monocrystals and Their Photoactivation," V. Ye. Lashkarev, Acting Mem, Acad Sci Ukrainian SSR, V. S. Medvedev, A. I. Skopenko, G. A. Fedorus, M. K. Sheynkman, Inst of Phys, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 86, No 5, pp 905-907

At 7th Conference of Semiconductors in 1950 (cf. Lashkarev et al., "Iz AN SSSR, Ser Fiz" 16, 81 (1952)) photoactivity of CdS monocrystals was reported activated by light. Show that photoresistance of CdS is only one exhibiting, in addition to high sensitivity, practically horizontal spectral characteristics within band 0.4 to 0.2µ. Received 5 Aug 52.

PA 245T94

245T94

FAYDYSH, O.M.; LASHKAR'OV, V.E., diysnyy chlen.

Transfer of electron-excitation energy in congealed solutions of anthracene and naphthacene. Dop.AN URSR no.3:215-219 '53. (MLRA 6:6)

1. Kiyivskyy derzhavnyy universytet (for Faydysh). 2. Akademiya nauk Ukrayins'koyi RSR (for Lashkar'ov). (Electrons) (Anthracene) (Naphthacene)

LASHAREV, V. YE.

DEYGEN, M.F.; LASHKAREV, V.Ye.

Transparency coefficient of semiconductor--metal contacts. Trudy Inst.fiz. AN URSR no.4:3:10 '53. (MLRA 7:12)
(Semiconductors)

LASHKAREV, V.Ye., professor, deystvitel'nyy chlen (g.Kiyev).

New data in the physics of semiconductors. Fiz.v shkole no.6:7-16 '53. (MLRA 6:10)

1. Akademiya nauk Ukrainskoy SSR. (Semiconductors)

LASHKAREV, V. YE.

USSR/Physics - Infrared Photoelements 11 May 53

"Sensitivity, in the Infrared Region , of Cuprous Oxide Photoelements Manufactured at Low Pressure in a High-Frequency Field," A. I. Andreyevskiy and A. L. Rvachev, Lvov Polytech Inst

DAN SSSR, Vol 89, No 2, pp 245-247

Exptl oxidation of Cu at low pressure in a hf field showed that, depending on pressure, the hf discharge considerably affects the oxidation process, cuprous and cupric oxide being reduced to pure copper simultaneously. The first Cu_2O photoelements with max sensitivity to infrared were produced by V. Ye. Lashkarev and K. M. Kosonogova (Iz Ak Nauk SSSR, Ser Fiz, 4-5 (1941)). Presented by Acad A. N. Terenin. Recd 22 Dec 52.

264T95

LASHKAREV, V. E.

USSR/Physics - Luminescence

Card 1/1 : Pub. 22 - 16/44

Authors : Karakhanin, Ya. I., and Lashkarev, V. E., active member of the Active member of the Acad. of Scs. of the Ukr. SSR

Title : About the nature of cuprous sulfate luminescence

Periodical : Dok. AN SSSR 97/6, 1007-1010, Aug 21, 1954

Abstract : Experimental study of cuprous sulfate (Cu_2O) luminescence is described. Dependence of the luminescence on temperature and conductivity of the Cu_2O, was investigated. The role played by photo-electons and excitons as the source of the luminescence was investigated by placing samples into an electric field. Twelve references (1941-1954). Graphs.

Institution : Kiev State University im. T. G. Shevchenko

Submitted : ...

Lashkarev, V. Ye.

USSR/Optics - Physical Optics. K-5

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12889

Author : Lashkarev, V.Ye., Karkhanin, Yu.I.
Inst : -
Title : Length of the Diffusion Displacement of the Excitons in Cuprous Oxide.

Orig Pub : Dokl. AN SSSR, 1955, 101, No 5, 829-832

Abstract : An investigation was made of the diffusion tendency of excitons due to luminescence of cuprous oxide. The authors have started with the assumption that if the excitions are mobile and if conditions are created on the surface of the cuprous oxide specimen for their radiationless annihilation, then the luminescence turns out to be attenuated. The greater the coefficient of absorption k of the excited light, the greater the attenuation. The state of the surface of the cuprous oxide was varied by means of thin films of liquids, such as water, dehydrated alcohol, acetone,

Card 1/3

T.G. Shevchenko, State Univ. Kiev.

and benzol. An investigation was made with specimens of cuprous oxide, for which, in the 0.4 -- 0.65 micron region, the luminescence yield was independent of the exciting light. The influence of the adsorbed liquid is characterized by the quantity $C = I_a(\lambda)/I_0(\lambda)$, where $I_a(\lambda)$ and $I_0(\lambda)$ are the intensities of luminescence in the presence and the absence of liquid respectively. For all liquids, in the region 0.6 -- 0.73μ, C is independent of λ_E and is close to unity. When λ_E <0.6 microns, C is constant for all liquids with the exception of water, which gives a clearly pronounced reversible effect of reduction of luminescence with diminishing λ_E; viz: at $\lambda_E = 0.43$ microns, C is 3 -- 5 times smaller than the value at $\lambda_E = 0.6$ microns. Mixtures of water with alcohol or acetone give intermediate values of C. The diffusion lenght of the excition is calculated from the dependence of C on λ_E and from the previously-

Card 2/3

USSR/Optics - Physical Optics.

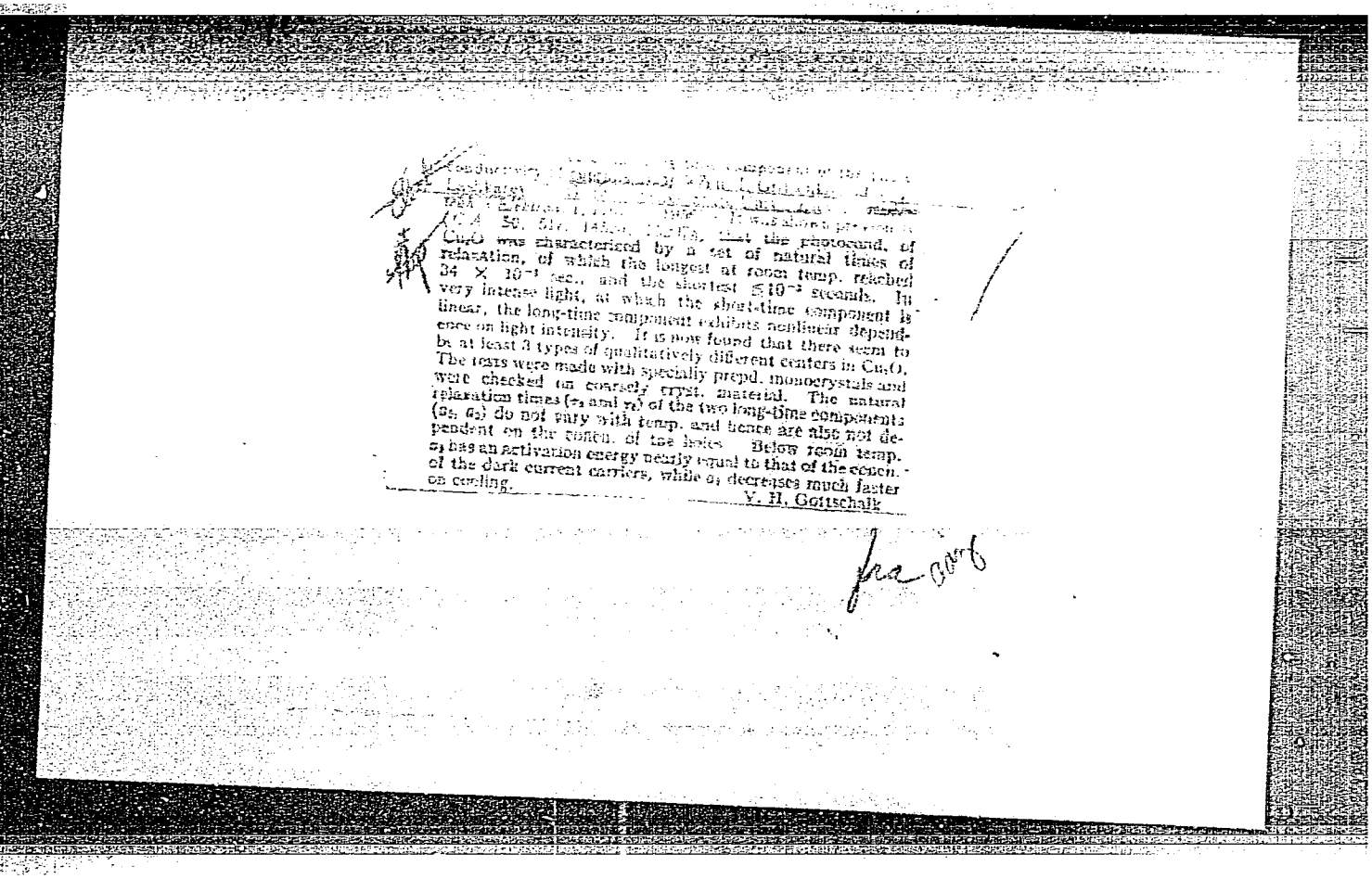
Abs Jour : Ref Zhur - Fizika, No 5, 1957, 12889 K-5

-determined dependence of k on λ_E (Lashkarev, V.Ye., Kosonogova, K.M., Zh eksperim i teor fiziki

LASHKAREV, V. E.

Volume photo-e.m.f. in semiconductors. V. E. Lashkarev and V. I. Romanov. *Radiotekh. i Elektron.* 1, 1154–6(1956); cf. *C.A.* 51, 6329a.—Vol. photo e.m.f., the name given for the original concept of photo e.m.f. in Ge in connection with the nonuniformity of the crystal with respect to its specific resistance (cf. E., *Dissertation*, 1956, Kiev State Univ., U.S.S.R.), was further investigated. The concept was so named in order to be distinguished from photo-e.m.f. related to the partition barriers: metal – semiconductor, *p* – *n*-transitions, etc. The electrode potential (*E*) was calcd. from the equation $E = \int_0^d i(x)\varepsilon(x)dx$, where $i(x)$ is e.d. caused by the flow of photoelectrons and $1/\rho = eUn$, where U is mobility of holes and n their concn. (cf. *C.A.* 44, 4771g). It was shown that measuring the volume photo-e.m.f. provides a very sensitive method of detecting nonuniformity in the distribution of specific resistance in semiconductors.

A. P. Vaitkus



Cu$_2$O was characterized by a set of natural times of relaxation, of which the longest at room temp. reached 34×10^{-3} sec., and the shortest $\leq 10^{-3}$ seconds. In very intense light, at which the short-time component is linear, the long-time component exhibits nonlinear dependence on light intensity. It is now found that there seem to be at least 3 types of qualitatively different centers in Cu$_2$O. The tests were made with specially prepd. monocrystals and were checked on coarsely cryst. material. The natural relaxation times (τ_2 and τ_3) of the two long-time components (a_2, a_3) do not vary with temp. and hence are also not dependent on the conen. of the ions. Below room temp. a_3 has an activation energy nearly equal to that of the concn. of the dark current carriers, while a_3 decreases much faster on cooling.

V. H. Gottschalk

LASHKAREV, V. YE.

USSR/Electricity - Semiconductors

G-3

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 7045

Author : Lashkarev, V.Ye., Romanov, V.A.
Title : Three-Dimensional Photo EMF in Semiconductors.

Orig Pub : Tr. In-ta fiziki AN USSR, 1956, vyp. 7, 50-59

Abstract : The photo emf occurring when a thin semiconductor, with a small resistivity gradient is illuminated by a narrow stationary light probe is theoretically derived. The magnitude of the three-dimensional photo emf is not a function of the absolute value if the specific resistivity, but only of its gradient. The sign of the photo emf is determined by the sign of the majority carriers and by the direction of the resistance gradient. The theory was verified with n-germanium/ Experience has shown that the theory gives the correct sign of the volume photo emf. The measured and calculated values of the volume photo emf were of the same order. The surface treatment affects the value of the photo emf to the same extent to which it changes the square of the diffusion length, but the overall variation of the photo emf does not change.

Card : 1/1

LASHKAREV, V. Ye. and ROMANOV, V. A.

"A Volume Photoelectromotive Force in Semiconductors," by V. Ye. Lashkarev and V. A. Romanov, Physics Institute, Academy of Sciences Ukrainian SSR, Radiotekhnika i Elektronika, No 8, Aug 56, pp 1144-1146

A theoretical consideration of volume photo-EMF observed by the authors in germanium and the results of an experiment verifying a theory on this phenomenon are presented in the article.

Reference is made to a work appearing in the Czechoslovak Physics Journal, 1955, 5, 178, by Ya. Tauts.

Sum 1274

LASHKAREV, V.Ye.

Thermal equilibrium of electrons on surface and volume levels in semiconductors. Izv.AN SSSR.Ser.fiz. 20 no.12:1469-1478 D '56. (MLRA 10:3)

1. Institut fiziki Akademii nauk USSR.
(Electrons) (Semiconductors)

LASHKAREV, V. Ye.

ZHIDKOV, V.A.; LASHKAREV, V.Ye.

New-type thermal acceptors in germanium. Izv.AN SSSR .Ser.fiz. 20 no.12:1521-1525 D '56. (MIRA 10:3)

1. Institut fiziki Akademii nauk USSR i Kiyevskiy gosudarstvennyy universitet im. T.G.Shevchenko.
(Germanium)

LASHKAR'OV, V.Ye.; ZADIRAKA, K.V.

Physics and mathematics in the Ukraine Academy of Sciences between the 19th and 20th Congress of the Communist Party. Visnyk AN URSR 27 no.2:39-43 F '56. (MLRA 9:6)
(Ukraine--Mathematics--Study and teaching)(Ukraine physics--Study and teaching)

LASHKAREV, V. YE.

USSR/Physical Chemistry - Crystals, [illegible]

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60930

Author: Iashkarev, V. Ye., Lyashenko, V. I.

Institution: None

Title: Surface Conductivity of Cuprous Oxide

Original Periodical: Dokl. AN SSSR, 1956, 106, No 2, 243-245

Abstract: Investigated were the effects of adsorption of C_2H_5OH vapor (I) on conductivity σ and mobility u of carriers in samples of Cu_2O calcinated in vacuum at 600°-1,000° and pickled in concentrated HNO_3. σ was measured lengthwise ($\sigma_{\parallel}$) and crosswise ($\sigma_{\perp}$) of the sample. In all samples $\sigma_{\parallel} \gg \sigma_{\perp}$. Ratio $\sigma_{\parallel}/\sigma_{\perp}$ reaches 170. Adsorption of vapor I reduces $\sigma_{\parallel}$ by 5-10 times. The conclusion is reached that $\sigma_{\parallel}$ is practically entirely of surface origin even after adsorption of vapor I. In vacuum u is several times smaller than in atmosphere of vapor I. The sign of Hall effect indicates a hole conductivity. From measurements of σ in the interval from

Card 1/2

USSR/Physical Chemistry - Crystals, B-5

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60930

Abstract: -70° to +20°, it was calculated according to formula $\sigma = A \cdot \exp(-E/kT)$ that energy of activation of surface ($E_{//}$) and volume ($E_{\perp}$) conductivity is respectively ~0.14 and 0.27 ev.

Card 2/2

26.2420
9.4177

86098
S/112/59/000/012/009/097
A052/A001

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1959, No. 12, p. 11, # 24000

AUTHORS: Kozhevin, V. E., Lashkarev, V. Ye.

TITLE: On the Sign and Kinetics of Capacitor Photoeffect in Semiconductors

PERIODICAL: Nauk. shchorichnyk. Radiofiz. fak. Kyivs'k. un-tu, 1956, Kyiv, 1957, pp. 483-485 (Ukrainian)

TEXT: The magnitude, sign and pulse shape of the capacitor photoeffect have been investigated in case of using different insulating washers. For investigation have been taken HgJ_2, PbJ_2, CdS, CdSe, CdTe, Se, Cu_2O, n-Ge and p-Ge. It has been established that the rise time of the capacitor photoeffect pulse with all semiconductors is as a rule very short ($<$ 1 millisecond) and for the majority of semiconductors it is shorter than the rise time of the lateral photoconductivity pulse τ_{pc}. The signs of light and dark carriers for CdS, Se, $Cu_2O(+)$, n-Ge and p-Ge coincide, however $Cu_2O(-)$ samples have been detected in which the sign of light carriers, which is determined by the capacitor photoeffect, is opposite to the sign of dark carriers. A stronginfluence of certain properties of insulating

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86098

S/112/59/000/012/009/097
A052/A001

On the Sign and Kinetics of Capacitor Photoeffect in Semiconductors

washers on the capacitor photoeffect has been observed. In the case of CdTe a substitution of mica by a cellophane washer leads to a change in the sign of the capacitor photoeffect. The capacitor photoeffect, valve photoeffect and photoconductivity of selenium are compared. It has been found that the kinetics of the capacitor photoeffect and valve photoeffect are characterized by very close rise times of pulses, much shorter than τ_{po}. The spectral distributions of the capacitor photoeffect and valve photoeffect are also very close and differ from the spectral distribution of photoconductivity. The author maintains that in all semiconductors studied (excepted CuO_2(+)) the capacitor photoeffect is connected with the presence of a bipolar photoconductivity and a curvature of energy zones on the boundary of semiconductors. This can lead to any sign of capacitor photoeffect. In this case the capacitor method cannot be considered as a reliable one for determining the sign of photocurrent carriers in semiconductors. There are 3 references.

A. F. A.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

86099

26.2420
9.4177

S/112/59/000/012/010/097
A052/A001

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1959, No. 12, pp. 11-12, # 24001

AUTHORS: Kozhevin, V.E., Lashkarev, V.Ye.

TITLE: Effect of External Voltage on Capacitor Photoeffect in Semiconductors

PERIODICAL: Nauk. shchorichnyk Radiofiz. fak. Kyivs'k. un-tu, 1956, Kyiv, 1957, pp. 485-487 (Ukrainian)

TEXT: The effect of external voltage on the capacitor photoeffect of HgI_2, PbI_2, CdS, CdSe, CdTe, Se, Cu_2O, n-Ge and p-Ge semiconductors has been investigated. In case of a good insulation (vacuum, air, polystyrene, mica) no effect of the external electric field on the capacitor photoeffect has been discovered. When using cellophane washers having some conductivity, the effect of the external field on the capacitor photoeffect has been observed in all semiconductors mentioned. In HgI_2, PbI_2 and CdS, the resistance of which changes manifold at irradiation, the photoconductivity is easily observed both when cellophane washers

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A052/A001

Effect of External Voltage on Capacitor Photoeffect in Semiconductors

are used and at a direct contact of the semiconductor with the electrodes. In this case the effect of the external voltage on the capacitor photoeffect is explained by the photoconductivity of semiconductors themselves. The magnitude and sign of the capacitor photoeffect are determined in this case by the magnitude and sign of the external voltage. For Se, Cu_2O, p-Ge and n-Ge semiconductors the effect of the external voltage on the capacitor photoeffect as well as the photoconductivity of the capacitor have been observed in presence of cellophane washers only. The effect has been strictly unipolar. The sign of the capacitor photoeffect has not changed under the influence of the external voltage. In this case the effect of the external voltage on the capacitor photoeffect is explained by the photoconductivity of the cellophane-semiconductor boundary, the resistance of which is considerably higher than the resistance of the semiconductors mentioned. On the basis of the results obtained it is maintained that the method of determining the sign of photocurrent carriers by the effect of the external voltage on the capacitor photoeffect amplitude cannot be always considered as a reliable one. There are 4 references.

A.F.A.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

86102

9.4300 (3203,1043,1143)

S/112/59/000/012/013/097
A052/A001

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1959, No. 12, p. 12, # 24004

AUTHORS: Zhidkov, V.A., Lashkarev, V.Ye.

TITLE: Diffusion and Electric State of Thermal Acceptors in Germanium

PERIODICAL: Nauk. shchorichnyk. Radiofiz. fak. Kyivs'k. un-tu, 1956, Kyiv, 1957, p. 493 (Ukrainian)

TEXT: The possibility of purifying Ge of thermal acceptors by heating the samples with direct or alternating current has been studied. The investigations have been carried out on monocrystalline plates of various thickness, fixed during heating between Ta-electrodes. In the process of heating a diffusion from thermal acceptors to the electrodes has been established which prevailed over evaporation up to 700°C in vacuum and at any temperature in the He atmosphere. At 800-850°C thermal acceptors carry a charge of +1 e and can be separated electrolytically by

Card 1/2

86102

S/112/59/000/012/013/097
A052/A001

Diffusion and Electric State of Thermal Acceptors in Germanium

heating with direct current. At temperatures approaching 700°C thermal acceptors are neutral. The quantitative theory of diffusion of thermal acceptors towards Ta-electrodes in presence of electric field is presented and tested. Considerations concerning a concentration dependence of the diffusion coefficient are presented.

A.F.A.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

86103

S/112/59/000/012/014/097
A052/A001

26.2420
9,4177

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1959, No. 12, p. 12,
24005

AUTHORS: Lashkarev, V.Ye., Litovchenko, V.G., Omel'yanovskaya, N.M., Bondarenko, R.M., Strikha, V.I.

TITLE: Dependence of the Life Time of Minority Charge Carriers on Concentration of Antimony Admixture in Germanium

PERIODICAL: Nauk. shchorichnyk. Radiofiz. fak. Kyivs'k. un-tu, 1956, Kyiv, 1957, pp. 495-496 (Ukrainian)

TEXT: The dependence of the life time τ of minority charge carriers on the concentration of Sb up to the values approaching the solubility limit of Sb in Ge ($n = 4 \cdot 10^{18}$ cm^{-3}) has been studied. The concentration has been determined from the Hall effect, τ has been measured by optical methods. It has been established that with n increasing from $5 \cdot 10^{13}$ to 10^{15} cm^{-3}, the life time was inversely proportional to n (τ decreased from 300 to 15 microseconds). At a further increase

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Dependence of the Life Time of Minority Charge Carriers on Concentration of Antimony Admixture in Germanium

of n the inverse proportionality did not hold and τ changed more slowly, attaining $\sim$ 2.5 microseconds at $n = 5 \cdot 10^{17}$ cm^{-3}. At n increasing up to $4 \cdot 10^{18}$ cm^{-3} the life time showed no noticeable decrease. When computing τ from the formula $D\tau = l_0^2$ the dependence of D on n was taken into account; at high values of n this dependence becomes strong. The found dependence of τ on n agrees with the Shockley-Reed recombination theory. There are 5 references.

A.F.A.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

LASHKAREV, V.E.

AUTHOR KOZHEVIN V.E., LASHKAREV V.E.

TITLE The effect of external potential and some other factors on capacity photo-response of semi-conductors. (Vliyaniye vneshnego napryazheniya i drugikh faktorov na kondensatornyy fotootvet poluprovodnikov.- Russian)

PA - 2585

PERIODICAL Radiotekhnika i Elektronika 1957, Vol 2, Nr 3, pp 260 - 268 (U.S.S.R.)

Received: 5/1957 Reviewed: 6/1957

ABSTRACT Lecture delivered at the All Union Conference for Semiconductors in November 1956 at Leningrad. Thanks to Putseyko's endeavors the condenser method for the investigation of the photo-conductivity of semiconductors is now widely in use, particularly for the determination of the sign of photocurrent carriers and the spectral distribution of photoconductivity. However, when using the condenser method it is by no means possible to give a unique interpretation of all properties of photoreaction observed. This refers to the sign of photoreaction as well as to the influence exercised by the nature of insulating intermediate layers on the phenomena enumerated. This paper deals with the investigation of these problems with respect to various semiconductors.- Investigations revealed the presence of electron states on the surface which cause the screening

CARD 1/2

effect and lead to the curvature of zones on the boundaries. This renders the method unreliable for the determination of the character of photoconductivity according to the sign of the photoreaction. Only if it were possible to control these curvatures would a unique determination of the character of photoconductivity be possible. In the next chapter the influence exercised by exterior voltage on the photoreaction for different insulating intermediary layers is investigated with the result that also in this case the method suggested by Putseyko is of a very doubtfull character. The last chapter deals with the influence exercised by constant additional illumination, and it was found that between the effect produced by exterior voltage on the photoreaction of HgJ_2 and that produced by constant additional illumination there is great similarity, but that the processes occurring in connection with the two phenomena differ from each other.
(With 3 tables and 14 citations from Slav publications)

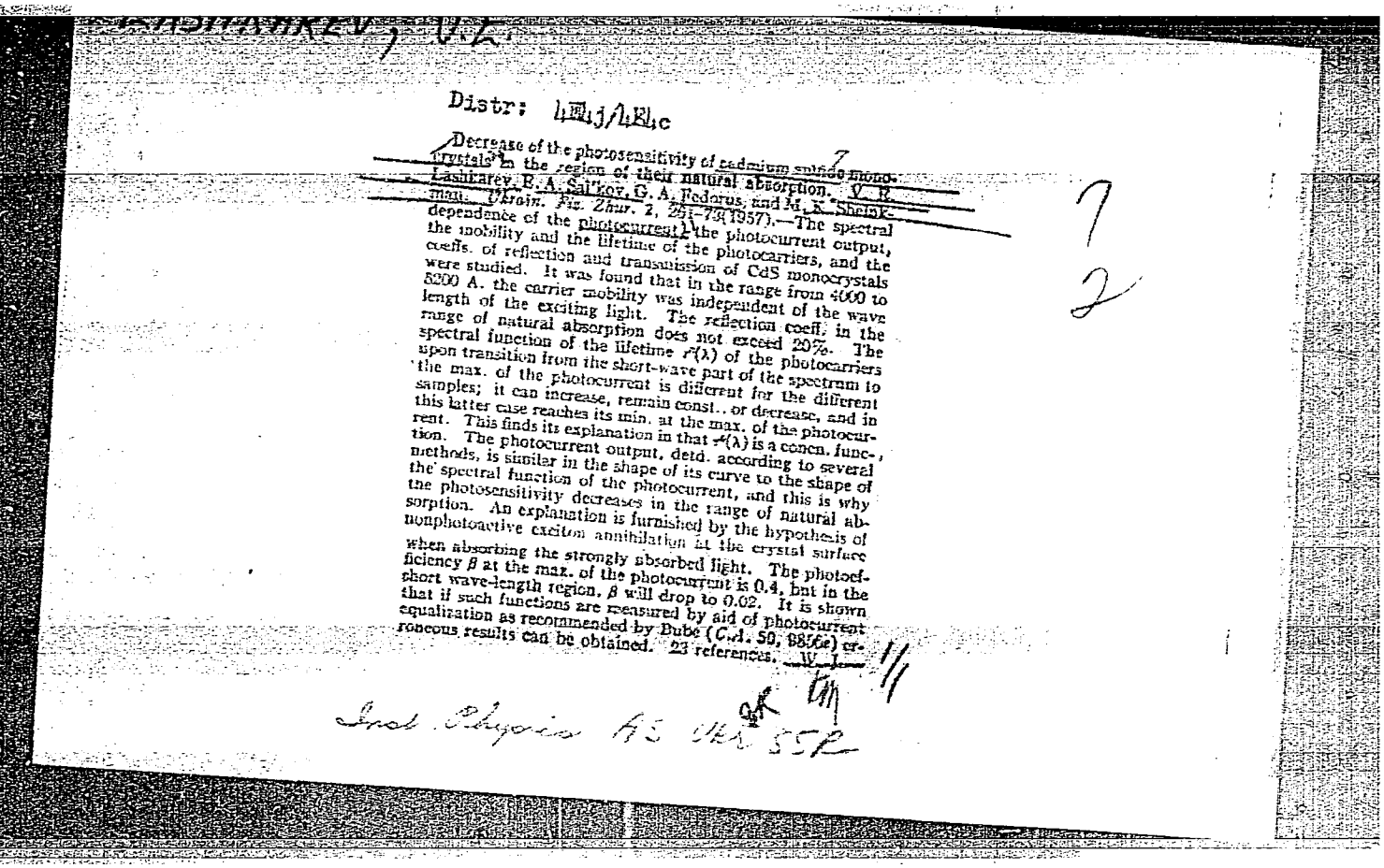
ASSOCIATION: Kiev State University T.G. Shevchenko (Kiyevskiy gosudarstvennyy universitet im.T.G. Shevchenko.)

PRESENTED BY: -

SUBMITTED: -

AVAILABLE: Library of Congress.

CARD 2/2



Distr: 4E4j/4E4c

Decrease of the photosensitivity of cadmium sulfide monocrystals in the region of their natural absorption. V. R. Lashkarev, R. A. Salkov, G. A. Fedorus, and M. K. Sheinkman. *Ukrain. Fiz. Zhur.* 2, 251–79(1957).—The spectral dependence of the photocurrent, the photocurrent output, the mobility and the lifetime of the photocarriers, and the coeffs. of reflection and transmission of CdS monocrystals were studied. It was found that in the range from 4000 to 5200 A. the carrier mobility was independent of the wave length of the exciting light. The reflection coeff. in the range of natural absorption does not exceed 20%. The spectral function of the lifetime $\tau(\lambda)$ of the photocarriers upon transition from the short-wave part of the spectrum to the max. of the photocurrent is different for the different samples; it can increase, remain const., or decrease, and in this latter case reaches its min. at the max. of the photocurrent. This finds its explanation in that $\tau(\lambda)$ is a concn.-func-tion. The photocurrent output, detd. according to several methods, is similar in the shape of its curve to the shape of the spectral function of the photocurrent, and this is why the photosensitivity decreases in the range of natural absorption. An explanation is furnished by the hypothesis of nonphotoactive exciton annihilation at the crystal surface when absorbing the strongly absorbed light. The photoefficiency β at the max. of the photocurrent is 0.4, but in the short wave-length region, β will drop to 0.02. It is shown that if such functions are measured by aid of photocurrent equalization as recommended by Bube (*C.A.* 50, 9876e) erroneous results can be obtained. 23 references. W. J.

Inst. Physics AS UkrSSR

LASHKAREV, V.Ye. [Iashkar'ov, V.IE.]; FEDORUS, G.A. [Fedorus, H.A.]; SHKLYNKMAN, M.K.

Diffusion of photocarriers in CdS single crystals. Ukr. fiz. zhur. 2 no.4:374-375 O-D '57. (MIRA 11:3)

1. Institut fiziki AN URSR.
(Cadmium sulfide--Electric properties) (Photoconductivity)

LASHKAREV - V. YE.

PA - 3537

AUTHOR: ZHIDKOV,V.A., LASHKAREV,V.Ye.

TITLE: Diffusion and Electric State of Thermal Acceptors in Germanium. (Diffuziya i elektricheskoye sostoyaniye termicheskikh aktseptorov, v germanii, Russian)

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 5, pp 877 - 883 (U.S.S.R.)

ABSTRACT: The repetition of the experiments carried out by MAYBURG (Phys.Rev., 95, 38, 1954) with samples of different lengths in the vacuum and in a helium atmosphere by using both alternating- and parallel current showed that the process for the removal of thermal acceptors by heating electric current is much more complicated than was assumed by MAYBURG. Germanium monocrystals of prismatic shape and 6 - 30 mm length and a cross section surface of 2 - 8 mm^2 were used. The construction of the apparatus and the method of thermal treatment were described by the authors already in Ian, ser.fiz., 20, Nr 12, 1956. By hardening by means of switching off the current it is possible to determine the dependence of the concentration of the thermal acceptors N_a on the time of heating for the various stages of heat treatment. There were 4 such stages. It was shown that when passing from heating by means of alternating current to heating by direct current at temperatures of more than 800° C the speed of purification increased considerably. The acceleration of the purification of germanium from thermal acceptors by means of direct current proves the ionized state of the admixture

Card 1/2

Diffusion and Electric State of Thermal Acceptors in Germanium.

under these conditions. The theory of purification is given and compared with the experiment. Experiments showed that the behavior of the acceptors removed from the germanium is similar to that of copper in germanium. Experiments carried out with samples saturated with radioactive Cu^{64} showed that after 1,5 - 3 hours of heating by means of alternating current at 815 - 850° C a considerable activity of the tantalum electrodes sets in. Binding copper to tantalum which is in contact with germanium has for the first time been proved by this work. The dependence of the diffusion coefficient of the thermal acceptors on temperature was found and a dependence of the same on concentration was presumed. (6 illustrations and 2 Slavic references)

ASSOCIATION: Physical Institute of the Academy of Science of the U.S.S.R., Kiev State University.

PRESENTED BY:
SUBMITTED: 5.11.1956
AVAILABLE: Library of Congress

LASHKAREV, V. Ye.

AUTHOR BARANSKIY, P.I., and LASHKAREV, V.Ye. 57-6-2/36

TITLE Measurements of the ~~Volume Thermo-e.m.~~f. in Germanium. (Izmereniye ob"yemnoy termoeds v germanii - Russian)

PERIODICAL Zhurnal Tekhn. Fiz.,1957, Vol 27, Nr 6,pp 1161-1166, (U.S.S.R.)

ABSTRACT The basic errors developing on the occasion of investigating thermo-e.m.f. of the n- and p-type in germanium by means of pressing contacts were analysed. The authers show that the character of the surface treatment influences little the measuring results of α(e.m.f.) if the temperature gradient is produced not by means of heating one of the thermo-search electrode pins but of one of the head electrodes. Here the thermo-search electrode pins which are furniched with thermo elements are used only for the measurement of the temperature at the point of contact between the pin and the sample as well as for the measurement of the thermo-voltage between them. The authors show that by means of correct etching of the sample coinciding results can be obtained if temperature gradients are used which were produced in the one or the other aformentioned manner. The authom also show that $\leq\Delta T \leq 2^{o}C\alpha$ is dependent on ΔT in the interval $0,5 \leq\Delta T \leq 2^{o}C$,(6 illustr., 7 Slavic references).

ASSOCIATION Institute for Physics of the Academy of Science of the USSR,Kiew.

PRESENTED BY

SUBMITTED 14.12.1956

AVAILABLE Library of Congress.

Card 1/1

LASHKAREV, V. YE.

57-11-2/33

AUTHORS: Lashkarev, V. Ye., Litovchenko, V. G., Omel'yanovskaya, N. M., Bondarenko, R. N., Strikha, V. I.

TITLE: Lifetime Dependence of Foreign Current Carriers upon Concentration of Antimony Admixture in Germanium (Zavisimost' vremeni zhizni storonnikh nositeley toka ot kontsentratsii primesi sur'my v germanii).

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 11, pp. 2437-2439 (USSR).

ABSTRACT: The dependence of lifetime τ of the antimony concentration admixture is investigated up to the boundary which lies near the solubility boundary of antimony in germanium $n \approx 4.10^{18}$ cm^{-3} at a great number of germanium patterns. τ was measured by means of optical methods. It is shown that in the case of an increase of the antimony admixture concentration of from $n = 5.10^{13}$ cm^{-3} to $n = 10^{15}$ cm^{-3} it was again confirmed that τ is inversely proportional to n. In the case of a further increase of the concentration this is disturbed, is slowly reduced and reaches the value $\tau \approx 2{,}8\,\mu$sec at $n = 5.10^{17}$ cm^{-3}. This value scarcely changes in the case of a further increase of n up to the maximum concentrations ($n = 4.10^{18}$ cm^{-3}). It is shown that

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57-11-2/33

Lifetime Dependence of Foreign Current Carriers upon Concentration of Antimony Admixture in Germanium.

the independence of the lifetime τ of n at great n follows immediately from the recombination theory of W. Shockley and W. Read a fact which was also observed here in the investigations. It is furthermore shown that in this case the deep-lying levels are responsible for the recombination. The conclusion can be drawn that the admixture atoms of the antimony are not immediately the effective recombination centres. Apparently the not controllable, deeper lying admixtures are responsible for the recombination. These admixtures are introduced either together with the antimony or they are already present in the germanium initial material. The introduction of antimony leads to an alteration of the position of the Fermi-level i. e. of the ionization degree of this recombination level which leads, however, to the increase of the recombination probability.
There are 2 figures and 3 Slavic references.

ASSOCIATION: Kiyev State University (Kiyevskiy gosudarstvennyy universitet).

SUBMITTED: April 15, 1957.

AVAILABLE: Library of Congress.

Card 2/2

AUTHORS: Lashkarev, V. Ye., Member of the Academy of Sciences of the Ukrainian SSR, Sal'kov, Ye. A., Fedorus, G. A., Sheynkman, M.K. 20-114-6-18/54

TITLE: The Shape of the Spectral Distribution of Photoconductance by Single Crystals of CdS (O forme spektral'nogo raspredeleniya fotoprovodimosti monokristallov CdS)

PERIODICAL: Doklady Akademii Nauk SSSR,1957,Vol.114,Nr 6,pp.1203-1205(USSR)

ABSTRACT: The experiments were carried out with monocrystals of Cd which were obtained by a synthesis of Cd vapors and sulfur. The electrodes were produced by vaporizing of indium in vacuo. A UM-2 monochromator with a special incandescent lamp (340 Watt) served as light source. The spectral characteristic of the photocurrent was determined at stationary illumination of the sample. The investigation of the spectral dependence of the proper time of the photocarrier is also described here. The authors shortly discuss the measurements of the following quantities: momentary proper time τ^{o} of the decrease of the photocurrent at the moment of the emission of light, the yield of the photocurrent a_{o}, the mobility of the photocarrier.

Card 1/3

The Shape of the Spectral Distribution of Photoconductance by Single Crystals of CdS

The measurements of the reflection coefficient showed that on transition to a strongly absorbable light the reflection coefficient does practically not change at all and that its value in the range of proper absorption does not exceed 20 %. At a maximum of the photocurrent the curve $\tau^{o}(\lambda)$ has a minimum. The spectral dependences $a_o(\lambda)$ and $a_d(\lambda)$ (the latter apparently means the differential yield) have a character analogous to the dependence of the photocurrent $I_{\Phi}(\lambda)$, where the maximum is most clearly marked off at $a_d(\lambda)$. The here obtaind dependences $a_o(\lambda)$ and $a_d(\lambda)$ can be explained on the basis of the exiton mechanism of photoconductivity in CdS monocrystals. The cause of the decrease of the photocurrent within the range of main absorption of the lattice in the CdS monocrystals is the decrease of the yield of the photocurrent, but not the decrease of the eigen time of the carrier. There are 3 figures and 10 references, 2 of which are Slavic.

ASSOCIATION: Institute for Physics of the AS Ukrainian SSR
(Institut fiziki Akademii nauk USSR)

LASHKAREV, V.Ye. [Lashkar'ov, V.IE]; SAL'KOV, Ye.A. [Sal'kov, IE.A.]; FEDORUS, G.A. [Fedorus, H.A.]; SHEYNKMAN, M.K.

Study of the spectral characteristics of cadmium selenide crystals [in Ukrainian with summary in English]. Ukr. fiz. zhur. 3 no.2: 204-215 Mr-Ap '58. (MIRA 11:6)

1.Institut fiziki AN URSR.
(Cadmium selenide--Spectra) (Photoelectricity)

AUTHORS: Lashkarev, V. Ye., Reshba, E. I., Romanov, V. A., Demidenko, Z. A. SOV/57-28-9-1/33

TITLE: Kinetics of Some Electronic Processes in Semiconductors (Kinetika nekotorykh elektronnykh protsessov v poluprovodnikakh)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 9, pp 1853-1870 (USSR)

ABSTRACT: This is an investigation of some electronic processes in semiconductors. It is postulated that the absorption of the light quantum leads to the production of a pair of electron holes in the same place in the crystal. This implies that the particular features connected with the possible participation of excitons in the development of photoconductivity are not taken into consideration. The kinetics of photoconductivity, of the bulk photo e.m.f., of the photomagnetic effect, and of the photoconductivity in semiconductors subjected to a magnetic field are investigated. Equations describing these effects are derived in linear approximation. After the kinetics of the electronic processes had been studied, the problems involved in the determination of

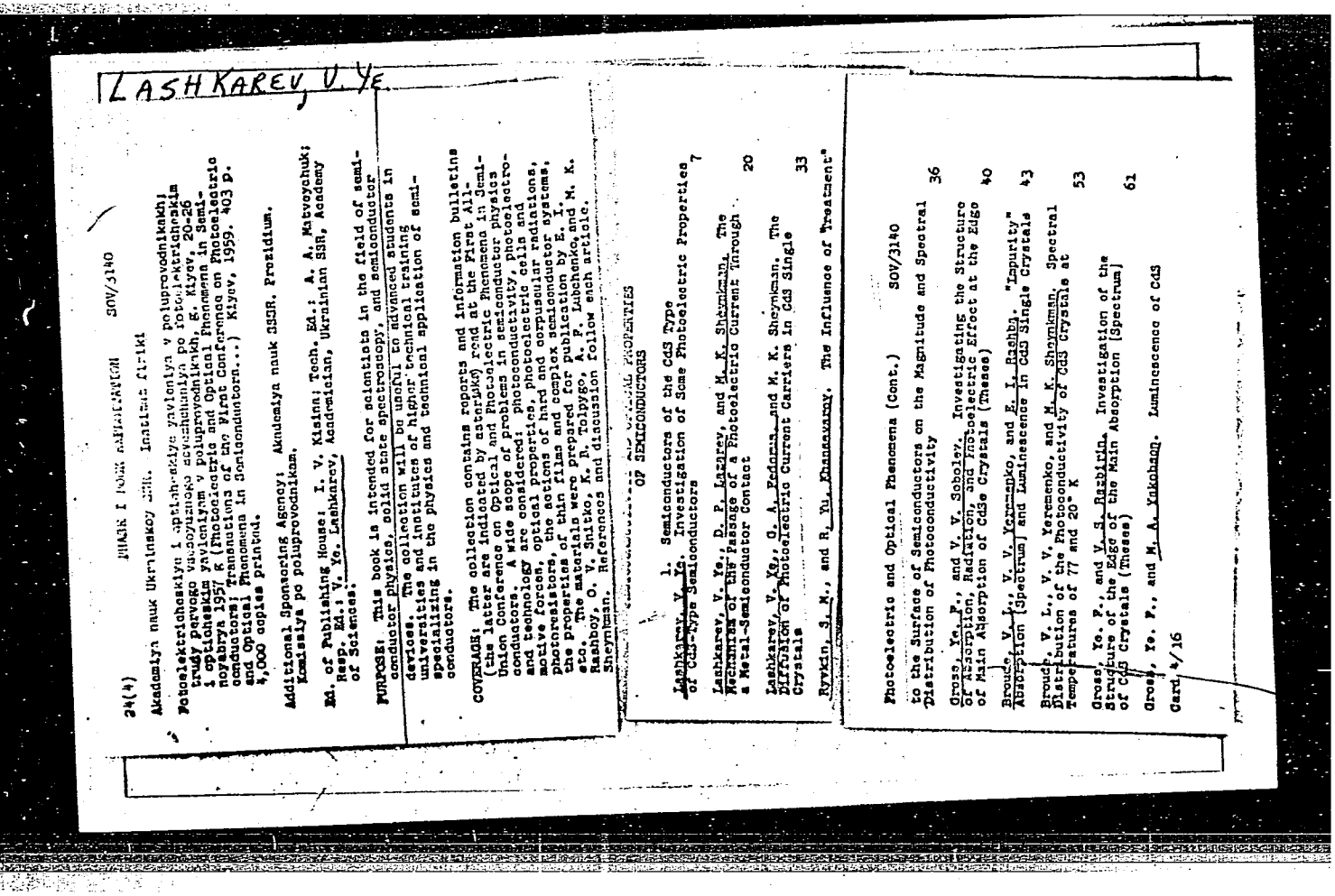
Card 1/3

Kinetics of Some Electronic Processes in Semiconductors SOV/57-2-9-1/33

the parameters of bulk and of surface recombination are discussed. In particular it is shown that a joint investigation of the kinetics of photoconductivity and of the photo e.m.f. facilitates a simple judgement on the occurrence of a carrier capture. The general formulae deduced are applied to the investigation of a number of sample cases. An experimental equipment incorporating a Kerr-cell was constructed. It permitted to make measurements in a wide range of temperature and frequency with a high accuracy. Experimental evidence bearing on the kinetics of photoconductivity and the volume e.m.f. is presented. It is then compared with theory. Ye G. Miselyuk, A.N. Kvasnitskaya and E.B. Mertens made available the germanium samples.
There are 10 figures and 24 references, 18 of which are Soviet.

ASSOCIATION: Institut fiziki AN USSR, Kiyev (Institute of Physics, AS UkrSSR, Kiyev)

Card 2/3



LASHKAREV, V. Ye.

24(4) PHASE I BOOK EXPLOITATION SOV/3140

Akademiya nauk Ukrainskoy SSR. Institut fiziki

Poluprovodnikovyye i optiko-zapiruyushchiye yavleniya v poluprovodnikakh; trudy pervogo vsesoyuznogo soveshchaniya po poluprovodnikam (Photoelectric and Optical Phenomena in Semiconductors; Transactions of the First Conference on Photoelectric and Optical Phenomena in Semiconductors...) Kiyev, 1959. 403 p. 4,000 copies printed.

Additional Sponsoring Agency: Akademiya nauk SSSR. Prezidium.

Komissiya po poluprovodnikam.

Ed. of Publishing House: I. V. Kistina; Tech. Ed.: A. A. Matveychuk; Resp. Ed.: V. Ye. Lashkarev, Academician, Ukrainian SSR, Academy of Sciences.

PURPOSE: This book is intended for scientists in the field of semiconductor physics, solid state spectroscopy, and semiconductor devices. The collection will be useful to advanced students in universities and institutes of higher technical training specializing in the physics and technical application of semiconductors.

COVERAGE: The collection contains reports and information bulletins (the latter are indicated by asterisks) read at the First All-Union Conference on Optical and Photoelectric Phenomena in Semiconductors. A wide scope of problems in semiconductor physics and technology are considered: photoelectric cells and photoconductivity, photoelectric and corpuscular radiations, motive forces, optical properties of thin films and complex semiconductor systems, photoresistors, the actions of hard and complex semiconductor systems, the properties of thin films and for publication by E. I. Rashba, O. V. Snitko, K. P. Tolypko, A. F. Lubchenko, and M. K. Sheynman. The materials were prepared for publication by E. I. Rashba, O. V. Snitko, K. P. Tolypko, A. F. Lubchenko, and M. K. Sheynman. References and discussion follow each article.

TABLE OF CONTENTS

s/058/62/000/008/080/134
A061/A101

9.4177

AUTHOR: Lashkarev, V. Ye.

TITLE: Study of some photoelectric properties of CdS-type semiconductors

PERIODICAL: Referativnyy zhurnal, Fizika, no. 8, 1962, 29, abstract 8E218 (In collection: "Fotoelektr. i optich. yavleniya v poluprovodnikakh", Kiyev, AN USSR, 1959, 7 - 19)

TEXT: The nature of the photocurrent drop in the shortwave spectrum region, which is typical of CdS single crystals, has been examined. The spectral distribution of the quantum yield, which decreases rapidly in the shortwave spectrum region, has been found to have a determining effect upon the spectral distribution of the photosensitivity of CdS-type crystals. The proper carrier lifetime remains about constant in the said region. From the confrontation between experimental results and calculations in another paper (RZhFiz, 1959, no. 3, 6071) the conclusion is reached that the recombination of photocurrent carriers on the surface of CdS and similar single crystals, while probably existing, does not decisively affect the shape of the spectral distribution of photosensitivity.

O. Shustova

[Abstracter's note: Complete translation]

Card 1/1

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24.2600
9.4177

S/058/62/000/008/081/134
A062/A101

AUTHORS: Lashkarev, V. Ye., Lazarev, D. P., Sheynkman, M. K.

TITLE: On the passage mechanism of through photocurrent in a metal-semiconductor contact

PERIODICAL: Referativnyy zhurnal, Fizika, no. 8, 1962, 29, abstract 8E219 (In collection: "Fotoelektr. i optich. yavleniya v poluprovodnikakh" Kiyev, AN USSR, 1959, 20 - 32)

TEXT: Investigations were made of the phenomena that take place on a metal-semiconductor contact at a uniform and probe illumination of monocrystalline CdS samples. The generation of large photocurrents, many times exceeding the dark currents, is explained by the idea of a gate - a thin (10^{-7} cm) double layer (the electrons on the metal, the holes on the semiconductor), formed upon the illumination of the crystal and reducing the inner work function in the metal -> semiconductor direction. Observations of the potential distribution along the CdS crystal with Au (non ohmic) contacts have indicated the presence of potential jumps at the electrodes attaining 40 - 70 % of the total voltage drop on the sample. The ob-

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served potential drop at the cathode embraces not only the gate region, but also a portion of the semiconductor volume (the so-called photocurrent barrier layer). With an increase of illumination the barrier potential jumps increase on the cathode and decrease on the anode. When illuminating an ohmic In contact one observes either a reduction of the "antibarrier ability" thereof or even a transition to the "barrier ability", analogous to the increase of the barrier jump on a gold cathode. The probe characteristics of the samples, that is, the magnitudes of the stationary currents traversing the sample as a function of the position of the luminous probe between the electrodes, were investigated. A small photocurrent drop is observed when displacing the luminous probe from the cathode to the anode (length of the sample: 1 - 1.5 mm). The time of setting up of the stationary photocurrent on probe illumination of an In anode (cathode of gold) is 10 times longer than in the case of a Au anode (cathode of indium). The unusual inertness on the anode illumination when the cathode is a barrier electrode (Au) serves, in the authors' opinion, as a direct confirmation of the hypothesis on the necessity of accumulating holes to form a gate. Illuminating a cathode of indium as well as of gold reduces by entire orders of magnitude the photocurrent rise time in comparison with the illumination of the anodes. For that reason,

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when applying an a.c. voltage and a luminous probe, i.e. when the latter alternately illuminates the anode or the cathode, a rectifying effect arises on the photocurrent that can attain a few orders of magnitude and exceed many times the same effect observed under stationary conditions. The photocurrent decay after the light is switched off is by orders of magnitude faster than the setting up of the photocurrent upon illumination of the samples. Experiments intended to study the probe action with infra-red light at a uniform illumination of the samples have shown that the infra-red probe particularly efficiently reduces the stationary photocurrent when illuminating the cathode. This can also be connected with the effect of infra-red light on the positive space charge at the cathode.

O. Shustova

[Abstracter's note: Complete translation]

Card 3/3

LASHKAREV, V.Ye. [Lashkar'ov, V.IE]; BONDARENKO, R.N. [Bondarenko, R.M.]; DOBROVOL'SKIY, V.N. [Dobrovol's'kyi, V.M.]; ZUBRIN, G.P. [Zubrin, H.P.]; LITOVCHENKO, V.G. [Lytovchenko, V.H.]; STRIKHA, V.I.

Properties of germanium containing beryllium admixtures. Ukr. fiz. zhur. 4 no.3:372-375 My-Je '59. (MIRA 13:2)

1.Kiyevskiy gosudarstvennyy universitet im. T.G. Shevchenko.
(Germanium) (Beryllium)

25683 S/181/61/003/007/005/023
B102/B202

24.7700 (1482,1138,1035)

AUTHOR: Lashkarev, V. Ye.

TITLE: Kinetics of the "quasimonopolar" photoconductivity of semiconductors

PERIODICAL: Fizika tverdogo tela, v. 3, no. 7, 1961, 1963 - 1972

TEXT: The kinetics of the photoconductivity (pc) of an impurity (n-type) semiconductor may be divided into three types: 1) Monopolar pc. Light excites photoelectrons in the conduction band; no photo-holes occur; the quantum energy is less than the forbidden-band width. 2) "Quasimonopolar" pc. Light produces pairs, however, the electronic component of pc predominates (this is either the case when the hole mobility is lower or when they are captured more rapidly). In the latter case, pc is bipolar at the first instant (for CdS ≤ 0.1 sec, for $Cu_2O \leq 5$ sec). 3) Bipolar pc; the electron and hole components of pc are of the same order of magnitude. The author attempts to find a most general representation of the energetic structure (electron transition) for case 2) which corresponds to the case of a real semiconductor. When selecting the scheme of the

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electron transitions the fact that the process of photo-current carrier production may be rather complex and may take place in two ways (by intrinsic impurity excitation and exciton excitation) has to be considered. The theoretical considerations are based on the scheme shown in the figure which is divided into an upper and a lower part by dashed lines. The lower part shows the local centers. Heat exchange takes place between these centers and the valence band. In the dark they are practically filled up with electrons. It is assumed that no dark holes exist in the valence band. The upper part of the scheme shows the remaining local levels. Letters and arrows denote the number of transitions per cm^3 and sec: L - number of quanta absorbed, G with various indices - partial quantum yields according to the different optical excitations, D - thermal excitations T - captures on the corresponding levels, R - recombination processes leading to an excitation of electrons from the upper part. The scheme may show a multiplicity of the levels (of type i and j). Thus, e. g., the existence of LG_i transitions takes account of the possibility that light of the same spectral composition may produce pairs as well as an impurity-type photoeffect; N is the electron concentration in the band, N_i and N_j that on the levels i and j (the level concentrations are denoted

by $\mathfrak{N}_i$ and $\mathfrak{N}_j$). The fundamental kinetic equations of the problem are given by

$$\frac{d}{dt}\left(N+\sum_i N_i\right)=LG-R, \qquad (1)$$

$$G=G_0+\sum_i G_i''; \quad R=R_0+\sum_i R_i+\sum_j R_j.$$

$$\left.\begin{aligned} T_i&=C_i(\mathfrak{N}_i-N_i)N; \quad D_i=C_iQ_iN_i;\\ Q_i&=Q_0\exp\left(-\frac{U_i}{kT}\right); \quad Q_0=\frac{2(2\pi m_e^* kT)^{3/2}}{h^3}; \end{aligned}\right\} \qquad (2)$$

$$\left.\begin{aligned} T_j&=C_jN_jp; \qquad D_j=C_jQ_j(\mathfrak{N}_j-N_j);\\ Q_j&=Q_p\exp\left(-\frac{U_j}{kT}\right); \quad Q_p=\frac{2(2\pi m_p^* kT)^{3/2}}{h^3}; \end{aligned}\right\} \qquad (3)$$

$$G_i'=\alpha_i'N_i; \quad G_i''=\alpha_i''(\mathfrak{N}_i-N_i); \qquad (4)$$

$$R_j=C_jN(\mathfrak{N}_j-N_j); \quad R_i=C_i'N_ip; \quad R_0=C_0Np. \qquad (5)$$

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define further quantities which are used in the relations derived in the following. U_i and U_j are the energetic distances of the local centers from the corresponding bands. The coefficients C are proportional to the cross sections of the processes. Furthermore, $R_i = R_i(N_i, p)$, $R_j = R_j(N, N_j)$; $R_g = R_g(N, p)$; or equilibrium on the j-levels, $N_j = N_j(N, p)$ and $R_j = R_j(N, p)$. The condition of neutrality in this case reads $F(N, N_i, p) = 0$. Thus, (1) can be written in the form $\frac{d}{dt}(N + N_i) = LG(N_i) - R(N, N_i)$ where the summation sign is omitted for simplicity.

If, in the case of low light intensity, recombination takes place exclusively, i. e., if R is independent of N_i then $\frac{d}{dt}(N + \Sigma N_i) = LG(N_i) - R(N)$ has to be used instead of (1). From these fundamental equations, relations which hold for the local centers in the steady case and when the electron concentration N varies discontinuously with time are derived in the following. Equation

$$\frac{dN_i}{dt} + [C_i(Q_i + N) + C_i'p + L(\alpha_i' + \alpha_i'')]N_i = \mathfrak{N}_i(C_iN + L\alpha''). \quad (11)$$

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Kinetics of the "quasimonopolar" ...

which corresponds to the relaxation equation $\frac{dN_i}{dt} + \frac{N_i}{\tau_i} = \frac{N_i^0(N)}{\tau_i}$, is derived; it holds when $\frac{1}{\tau_i} = c_i(Q_i + N) + c_i p + L(\alpha_i' + \alpha_i'')$ (12) is fulfilled. The author then discusses the method of additional Π-pulses and the method of the alternating-photocurrent bridge. The former consists in adding a Π - pulse of the intensity 1 and the duration Δt to the constant light of the intensity L^0. The straight part of the curve of photocurrent rise is studied and a number of relations are given. The second method consists in applying a constant voltage across the sample and in measuring the variable photocurrent originating from a weak sinusoidal light signal according to the variable voltage by means of compensation. The photocurrent measured in this case is proportional to the concentration of the photoelectrons. A variant of this method termed method of the alternating-resistance bridge is discussed. In this case, not a constant voltage but a constant current is applied to the sample and the voltage course over the sample itself is measured. The theoretical studies show that the two methods are well suited for studying electron transitions and that they

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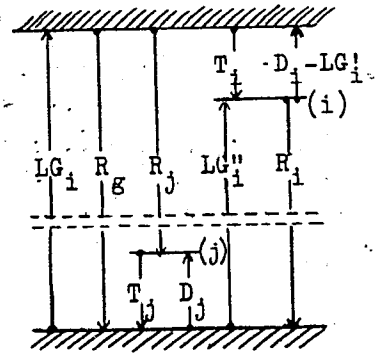
complete each other. The latter method was suggested by V. Ye. Lashkarev and I. R. Potapenko (Izv. AN SSSR, ser. fiz. 8, 566, 1949). There are 1 figure and 9 references: 8 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN USSR Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: January 28, 1961



Card 6/6

25684 S/181/61/003/007/006/023
B102/B202

24.7000 (1035, 1138, 1482)

AUTHORS: Lashkarev, V. Ye., Sal'kov, Ye. A., and Sheynkman, M. K.

TITLE: Study of the photoactivation of the photocurrent yield in CdS single crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 7, 1961, 1973 - 1982

TEXT: The authors attempted to study the activation of the photocurrent yield in CdS-type single crystals in a temperature range of from - 70 to + 115°C. The method consists in the following: the specimen is exposed to short rectangular pulses and, independently thereof , also subjected to an exposure constant with time; the experiment shows that with increasing intensity of illumination the slope of the first part of the curve of growth of the photocurrent determining the photocurrent yield increases. The photoactivation of CdS single crystals has been discovered and described by Lashkarev and G. A. Fedorus (Izv. AN SSSR, ser fiz. 16.81, 1952). It has been observed by the authors also in CdSe and CdS-CdSe. Several attempts have been made to a theoretical study and explanation of this effect. Thus, e. g., L. G. Paritskiy and

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Study of the photoactivation ...

S. M. Ryvkin (FTT, II, 545, 1960) explained the photoactivation in CdS-single crystals by the presence of fast adhesion levels for photocarriers. The authors found that in these crystals the curves of growth of the photocurrent consist of two parts with different slopes and that the exposure influences only the slope of the second part. In some cases the concepts on photoactivation strongly diverge. In view of the experimental results this process is obviously complicated. The present paper is intended to contribute to the explanation of these problems. The main possibilities of explaining the effect of photoactivation consist in the explanation of the relationship between the actual quantum yield G and the light intensity L as well as in an application of the concepts on the fast adhesion levels to the kinetics of the photocurrent. In order to explain the nature of the photoactivation, a so-called "discriminating experiment" is necessary which admits the clear determination of the proper mechanism. It is demonstrated that different mechanisms of photoactivation may lead to different shapes of the curves $G_f(N)$ where G_f is the slope of the second part of the curve of growth of the photocurrent and N the electron concentration. Three mechanisms are studied

more thoroughly. a) Existence of fast adhesion levels (discrete level of depth U_i, and concentration $\mathcal{N}_i$). $G_f(N)$ is then given by

$$G_f = \left[1 + \frac{\mathcal{N}_i Q_i}{(Q_i + N)^2}\right]^{-1} G(1)$$ where $Q_i = Q\exp(-U_i/kT)$, Q is a statistical factor of the conduction band equal to $3.10^{19}\,cm^{-3}$ at room temperature, when $m_{eff} = m_e$. b) The fast adhesion levels form not one discrete level but an energy band from U_1 to U_2 in which they are irregularly distributed with the density $\mathcal{N}(U)$;

$$G_f = \left[1 + \frac{\mathfrak{N}(U)}{Q_2 + N}\right]^{-1} G, \qquad (2)$$

$$Q_2 = Qe^{-\frac{U_2}{kT}};\quad Q_1 = Qe^{-\frac{U_1}{kT}}.$$

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then holds. c) The occurrence of carriers is the result of a photoactive exciton decay on an occupied slow electron level (concentration $\mathcal{N}_i$, depth U_i). Then, $G_f = \frac{N}{Q_i + N} G_{max}$ (3) where G_{max} is the maximum quantum yield, $Q_i = Q\exp(-U_i/kT)$. These three cases are theoretically studied in detail an the $G_f(x)$ curves, where $x = N/\mathcal{N}_i$, are compared. Experimental studies were made with non-treated CdS-single crystals (grown from vapor). Indium sputtered in a vacuum served as electrodes thus warranting the linearity of the volt-ampere characteristics in a wide range of voltage and concentration. Also, the lux-ampere characteristics were measured in all specimens. A Kerr cell served as light modulator. The curve of growth of the photocurrent a typical specimen is shown in Fig. 3. The $G_f(I_{phot})$ curves were taken from several specimens. According to the course of these curves the specimens could be divided into two groups. Compared to the theoretical results, the experiments show that in the CdS-single crystals with linear lux-ampere characteristic photoactivation.

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Study of the photoactivation...

is caused by the existence of fast adhesion levels of either discrete or continuous energy distribution. Photoactivity which is connected with a change of the actual quantum yield as the result of a change of the exposure intensity could not be observed. There are 6 figures and 9 references: 8 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN USSR Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: January 28, 1961

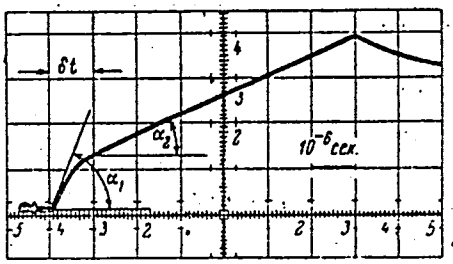

Fig. 3

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AUTHOR: Lashkarev, V. Ye.

TITLE: Some peculiarities of quasi-monopolar photoconduction in semiconductors

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 417 - 425

TEXT: On condition that $n \gg p$, it is assumed that light raises electrons directly from the recombination (r-) level into the conduction band. This conduction, called majority photoconduction, is characteristic of many semiconductors. An n-type semiconductor with one r-level and additional adhesion levels (t-levels) is studied; several effects are predicted, some of which could be previously demonstrated on CdS and other semiconductors. Results: (1) The presence of t-levels affects the lux-ampere characteristic of the semiconductor; it can lead to superlinearity of the characteristic if the t-levels lie below the r-levels. (2) If one of the inequalities $A_r \ll B_r\phi$ or $P_r^0 \ll (Q_r+N^0)\phi^0$ is satisfied, then there exists an illumination interval within which the t-levels determining the phenomenological photo yield do not change, whereas the relaxation time of the photoelectric

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current does. Q_r is the concentration of the recombination vacancies, $A_r = C_r P_r$, $B_r = C_r(Q_r + N)$, C_r is the probability of electron capture by a recombination center, P_r is the vacancy concentration in the recombination centers, and N is the free electron concentration. (3) The t-levels are divided into classes, M' and M" levels. If a square light pulse impinges on the semiconductor, the M' levels cause a rapid release of the photoconductivity; a negative release occurs after the square pulse. The M" levels produce a trivial rise and fall in the photoconductivity. (4) The t-levels accelerate the fast component of the photoconductivity. (5) When sinusoidally modulated light is used, a phase shift between light and photoelectric current occurs. There are 4 figures.

ASSOCIATION: Institut poluprovodnikov AN USSR, Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: August 6, 1962

Card 2/2

S/181/63/005/002/007/051
B104/B186

24 7100

AUTHOR: Lashkarev, V. Ye.

TITLE: The effect of an additional fast recombination channel on the phenomenological photo yield

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 426 - 433

TEXT: This paper investigates how the photo yield is affected by an ideal recombination s-channel. The latter is taken to mean levels that are fully occupied in the dark and in which every hole captured recombines with an electron. This second fast recombination channel is uniformly distributed over the volume under consideration. Proceeding from a set of linearized kinetic equations and from the neutrality condition, it is shown that its existence causes the phenomenological quantum yield to decrease with increasing illumination. The decrease continues down to whatever spectral composition corresponds with the light pulse whereby the quantum yield is determined. The presence of a fast recombination channel on the surface permits of introducing the concept of surface recombination rate; moreover, in the case of strong absorption of light, it becomes possible to explain why the rise and fall curves of the photocurrent in monopolar semiconductors

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The effect of an additional fast...

possess straight segments, from which the quantum yield G_f and proper time τ_f can be determined. At the same time, the decrease in the quantum yield on going over to stronger light absorption can be explained. The quantum yield can be considerably increased by introducing electrons into the system considered, particularly in the short wave range of the spectrum. The results are in good qualitative agreement with experimental results obtained using CdS. There are 3 figures.

ASSOCIATION: Institut poluprovodnikov AN USSR, Kiyev (Institute of Semiconductors AS UkrSSR, Kiyev)

SUBMITTED: August 6, 1962

Card 2/2

LASHKAREV, V.Ye.; GOLYNNAYA, G.I.; SHEYNKMAN, M.K.

Fast recombination channel on the surface of CdS single crystals. Fiz. tver. tela 5 no.12:3420-3425 D '63. (MIRA 17:2)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

KOLOMIYETS, B. T.; MAMONTOVA, T. N.; LEBEDEV, E. A.; MAZETS, T. F.; STEPANOV, G. I.; LASHKAREV, V. Ye.; SALKOV, E. A.; SHEYNKMAN, M. K.

"Fast recombination processes in single crystals of CdS and CdSe."

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24 Jul 64.

LASHKAREV, V.Ye.; LYUBCHENKO, A.V.; SHEYNKMAN, M.K.

Complex study of the kinetics of recombination and infrared quenching of the photocurrent in cadmium sulfide. Fiz. tver. tela 7 no.6:1717-1732 Je '65. (MIRA 18:6)

1. Institut poluprovodnikov AN UkrSSR, Kiyev.

L 38095-65 EWT(l)/EPA(s)-2/EWT(m)/BEC(t)/EWP(t)/EWP(b) Pt-10 IJP(c)
ACCESSION NR: AP5005911 JD/JG/AT S/0185/65/010/002/0166/0171

AUTHOR: Lashkar'ov, V. Ye. (Lashkarev, V. Ye); Rybalka, V. V.

TITLE: Photoconductivity relaxation with flashes in HgS doped with Cu

SOURCE: Ukrayins'kyy fizychnyy zhurnal, v. 10, no. 2, 1965, 166-171

TOPIC TAGS: mercury sulfide, photoconductivity, photoconductivity relaxation, intrinsic photoconductivity, adhesion level, electron capture cross section

ABSTRACT: The authors investigated the laws governing the relaxation of the intrinsic photoconductivity with flashes in HgS with impurities 0.001, 0.01, and 0.1 wt.% Cu. The samples were grown by a synthesis method in sealed quartz ampoules, and cleaved into individual crystallites. Crystallites without cracks and with smooth surface were chosen for the measurements, for which purpose they were placed in a cryostat where the investigations could be carried out in a range 90--40K and in vacuum $\sim 10^{-2}$ torr. The samples were illuminated with monochromatic light in the region of the maximum intrinsic photoconductivity, using a monochromator. The best results were obtained with samples containing 0.01% Cu.

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ACCESSION NR: AP5005911

Investigations made without constant illumination of the sample, at high pulsed light intensity, have shown that the increase in photoconductivity with flash extends over the entire investigated temperature interval. At temperatures below ~250K the photocurrent decreases to a stationary value after several hours. The results are in agreement with the theoretical calculations made by one of the authors earlier (Lashkarev, FTT v. 5, 417, 1963), where it was assumed that slow adhesion levels exist in the forbidden band of HgS(Cu). The depth of the slow adhesion level for electrons was found to be 0.6 eV, giving a value of $\sim 10^{-17}$ cm^2 for the cross section of capture of an electron by such a level. It is shown that if certain conditions are satisfied (Lashkarev, FTT v. 3, 1963, 1961) the fast adhesion levels do not influence the relative value of the flash or the time constant of the slow relaxation section. The temperature dependence of the time of relaxation following the flash is used to determine the parameters of the slow adhesion levels (0.6 eV, 10^{-17} cm^2). The temperature dependence of the relative magnitude of the flash agrees with these results. Orig. art. has: 5 figures and 13 formulas.

ASSOCIATION: Instytut napivprovidnykiv AN URSR , Kiev
(Institute of Semiconductors, AN UkrSSR)

Card 2/3

L 2197-66 EWT(1)/EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5014571 UR/0181/65/007/006/1717/1732

AUTHOR: Lashkarev, V. Ye.; Lyubchenko, A.V.; Sheynkman, M.K.

TITLE: Comprehensive investigation of the kinetics of the processes of recombination and infrared quenching of photocurrent and cadmium sulfide

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1717-1732

TOPIC TAGS: recombination luminescence, recombination radiation, ir radiation, luminescence quenching, cadmium sulfide, cadmium selenide

ABSTRACT: In view of the fact that earlier studies of infrared quenching and recombination in CdS were limited only to stationary or slow transient processes, the authors propose new independent methods of determining the various parameters characterizing the centers of slow and fast recombination in a unipolar photoconductor. It is shown in particular, that the initial sections of the infrared quenching relaxation curves can yield additional information on the parameters of the various recombination centers in CdS. The methods are based on a simultaneous study of the kinetics of the photo-

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ACCESSION NR: AP5014571

current and its infrared quenching in the presence of additional illumination produced by short duration light pulses of varying intensities and varying spectral contents. The measurements were made on thin single crystals of CdS and CdSe, grown by various methods. The constant illumination was produced with an incandescent lamp and a set of filters, and the additional light pulse was a flash lamp with pulse duration 2.5×10^{-6} sec and a set of filters. Longer pulses were produced with a mechanical disc shutter and an infrared monochromator. The pulse methods were supplemented with an analysis of the lux-ampere characteristic of the material. The parameters determined were the concentrations of the vacancies and of the electrons at the r- and s-levels, the concentrations of the levels themselves, the fractions of the various carriers captured at the r- and s-levels, and the cross section for the capture of an infrared photon by an unfilled r-center. The methods for obtaining the various parameters are indicated. The values of the recombination-center parameters measured by various methods, in single crystal CdS, and in part also in CdSe are good agreement. Orig. art. has: 7 figures, 26 formulas, and 3 tables.

L 2197-66

ACCESSION NR: AP5014571

ASSOCIATION: Institut poluprovodnikov AN UkrSSR, Kiev (Institute of Semiconductors, AN Ukr SSR) 44,55

SUBMITTED: 22Dec64 ENCL: 00 SUB CODE: SS, OP

NR REF SOV: 009 OTHER: 006

Card 3/3 OP

L 64309-65 EWA(h)/EWT(m)/T IJP(c) AT

ACCESSION NR: AP5012762 UR/0020/65/161/006/1310/1312

AUTHORS: Lashkarev, V. Ye. (Academician AN UkrSSR); Lyubchenko, A. V.; Sheynkman, M. K.

TITLE: Determination of the parameters of recombination centers in cadmium sulfide with the aid of the kinetics of infrared photocurrent quenching

SOURCE: AN SSSR. Doklady, v. 161, no. 6, 1965, 1310-1312

TOPIC TAGS: cadmium sulfide, radiative recombination, recombination reaction, capture cross section, IR photoconductor

ABSTRACT: Since earlier investigations of infrared quenching of photocurrent in semiconductors of the type $A_{II}B_{VI}$ have been made under stationary conditions or under slow transient conditions (on the order of several seconds or minutes), the authors investigated the kinetics of the infrared quenching by using short pulses, to be

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ACCESSION NR: AP5012762 3

able to determine the cross section for the capture of electrons by the recombination centers, and to determine the cross section for the capture of an infrared photon by a slow-recombination r-center. The theory of the phenomenon is discussed briefly. Pulses of 2.5 μsec from an infrared lamp (0.93 μ wavelength) were used. The cross section for the capture of an infrared photon by the r-level was found to be 0.8×10^{-16} cm^2, which is of the same order as the geometrical dimension of the atom. The probabilities for electron capture by s-centers and r-centers were found to be $(4--20) \times 10^{-10}$ and $(3--5) \times 10^{-13}$ cm^3/sec, the latter being close to those obtained by the authors by another method earlier (Fiz. tverd. tela v. 5, 387, 1963). Orig. art. has: 2 figures.

ASSOCIATION: Institut poluprovodnikov Akademii nauk UkrSSR (Institute of Semiconductors, Academy of Sciences UkrSSR)

SUBMITTED: 11Dec64 ENCL: 00 SUB CODE: SS,OP

NR REF SOV: 003 OTHER: 002

Card 2/2 RC

L 45455-66 EWT(l)/EWT(m)/T/EWP(t)/ETI IJP(c) JD/JG/AT

ACC NR: AP6022995 SOURCE CODE: UR/0185/66/011/004/0372/0382

AUTHOR: Lashkar'ov, V. Ye. — Lashkaryev, V. Ye.; Rybalka, V. V.

ORG: Institute of Semiconductors, AN URSR, Kiev (Institut napivprovidnykiv AN URSR)

TITLE: Photoconductivity and its infrared damping in mercury sulfide crystals doped with Cu and Ag

SOURCE: Ukrayins' kyy fizychnyy zhurnal, v. 11, no. 4, 1966, 372-382

TOPIC TAGS: photoconductivity, crystal impurity, electron recombination, free electron, capture cross section, V band, mercury sulfide crystal, infrared damping

ABSTRACT: An attempt has been made to investigate the regularities of stationary photoconductivity infrared damping, and their kinetics in artificial crystals of the red modification of an HgS admixture with Cu and Ag. It is shown that these impurities are responsible for the appearance of centers which are slow to recombine. A model

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ACC NR: AP6022995

is designed with two recombination channels by taking into account ejections of holes from the R-level to the V-band. The free electron concentration is much lower than the vacancy concentration in both slow and fast recombination. The cross sections of electron capture by slow recombination centers are $S_r \simeq 10^{-20}$ cm^2. The location of the sensitizing centers, determined by the position of the red border of infrared damping, is 1.0 ev for a Cu impurity and 0.7 ev for an Ag impurity. The temperature dependences are as follows: 0.55 ev for a Cu impurity and 0.27 ev for an Ag impurity. The effective hole-capture cross sections of these centers are equal to $g_r S_r \simeq 10^{-16}$ cm^2 for HgS(Cu) and $g_r S_r \simeq 10^{-17}$ cm^2 for HgS(Ag). The effective photon-capture cross section is $g_r \gamma = 1-3 \times 10^{-16}$ cm^2. Orig. art. has: 7 figures and 18 formulas. [Based on authors' abstract] [NT]

SUB CODE: 20/ SUBM DATE: 20Jul65/ ORIG REF: 006/ OTH REF: 003/

Card 2/2

ACC NR: AP7003646 SOURCE CODE: UR/0020/67/172/001/0077/0079

AUTHOR: Lashkarev, V. Ye. (Academician AN UkrSSR); Ptashchenko, A. A.

ORG: Institute of Semiconductors, Academy of Sciences, UkrSSR (Institut poluprovodnikov Akademii nauk UkrSSR); Odessa State University (Odesskiy gosudarstvennyy universitet)

TITLE: Investigation of the spectral dependence of photoionization of sensitizing centers in cadmium sulfide

SOURCE: AN SSSR. Doklady, v. 172, no. 1, 1967, 77-79

TOPIC TAGS: cadmium sulfide, optic material, luminescence quenching, photoionization, photoconductivity, impurity center, optic transition

ABSTRACT: This is a continuation of earlier work (FTT v. 8, 1623, 1966) where it was shown that impurity photoconductivity in CdS is connected with photoionization of the sensitizing centers (r-centers). To ascertain whether the differences in the spectral dependences of the impurity photocurrent, observed from sample to sample, are due to simultaneous quenching of the impurity luminescence or to the presence of transitions of electrons from s-centers to the c-band, the authors investigated the kinetics of the impurity photocurrent at different constant additional illumination in the fundamental absorption region. The measurements were made on CdS single crystals, with filtered incandescent illumination used for the intrinsic illumination, and short pulses of impurity illumination were produced by spark discharge. The results showed

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ACC NR: AP7003646

no noticeable influence of the transition from the s-centers to the c-band, making it possible to measure the spectral distribution of the photon capture cross section for a wide range of illumination. The cross sections experienced a large scatter even for equal values of photon fluxes, owing to the different degrees of filling of the r-centers with vacancies in different samples. This conclusion was confirmed by an independent test. The authors thank M. K. Sheynkman for useful discussion of the results. Orig. art. has: 4 figures and 3 formulas.

SUB CODE: 20/ SUBM DATE: 11Jun66/ ORIG REF: 004/ OTH REF: 001

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L 20396-66 ETC(f)/EPF(n)-2/EWG(m)/T/EWP(t) IJP(c) RDW/JD/WW
ACC NR: AP5022470 SOURCE CODE: GE/0030/65/011/001/0429/0441

AUTHOR: Lashkarev, V. Ye.; Sheynkman, M. K.

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TITLE: Determination of the parameters of sensitizing recombination centers in CdS and CdSe single crystals by temperature and optical quenching of photocurrents

SOURCE: Physica status solidi, v. 11, no. 1, 1965, 429-441

TOPIC TAGS: photoconductor, single crystal, parameter, electron capture, electron hole

ABSTRACT: New stationary and kinetic methods are proposed for determining the parameters of sensitizing recombination r-centers in high resistivity monopolar photoconductors. These methods are based on thermal and optical quenching of the photocurrent. They enable all the parameters of r-centers in CdS, CdSe, and partially

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Cd(S, Se) to be determined. These parameters include the concentration and energy centers, and their cross sections for electron and hole capture. The method also gives the cross sections for absorption and photons with energies of 0.9 and 1.4 eV, these photons transferring a hole from an r-center to an excited level, and to the valence band, respectively. The occupation of r-centers by holes under weak illumination and the probabilities of hole capture by r- and s-centers can be obtained. The experiments for determining the parameters of r-centers were carried out and discussed by the authors together with their collaborators Lubtchenko, A. V. (CdS) and Gorodetsky, I. Ya. and Yermolovich, I. B. (CdSe). The authors wish to thank them greatly. Orig. art. has: 5 figures, 19 formulas and 1 table. [Based on author's abstract]

SUB CODE: 20/ SUBM DATE: 05Jul65/ SOV REF: 006/
OTH REF: 013/

Card 2/2 BK

LASHKAREV, V.Ye., akademik; LYUBCHENKO, A.V.; SHEYNKMAN, M.K.

Use of the kinetics of infrared quenching of the photocurrent in determining the parameters of recombination centers in cadmium sulfide. Dokl. AN SSSR 161 no.6:1310-1312 Ap '65. (MIRA 18:5)

1. Institut poluprovodnikov AN UkrSSR. 2. AN UkrSSR (for Lashkarev).

ANIN, Yu.L.; LASHKAREVA, N.I.

Dissecting aneurysm of the aorta with tamponade of the heart.
Vrach. delo no.8:107-108 Ag '60. (MIRA 13:9)

1. Terapevticheskoye otdeleniye (zav - Yu.L. Anin) Khersonskoy lineynoy bol'nitsy vodnikov.
(AORTIC ANEURYSMS) (HEART)

28690
S/021/61/000/009/008/012
D274/D304

26,2532

AUTHORS: Lashkar'ov, G.V., and Samsonov, G.V., Corresponding Member AS UkrSSR

TITLE: Characteristics of refractory compounds of transition metals as materials for thermoelectric converters

PERIODICAL: Akademiya nauk UkrSSR. Dopovidi. no. 9, 1961, 1148-1150

TEXT: The quality factor $z=\alpha^2/\varkappa\rho$ of refractory compounds is roughly calculated, as well as the efficiency η_T (corresponding to it) for the case of the hot joint being at a temperature T_1-1200°K and the cold joint at T_0=400°K; (α is the thermal e.m.f.-coefficient, $\varkappa$ - the heat-conductivity coefficient, ρ - the resistivity). The choice of T_1 is related to the use of cheap natural gas as the thermal-energy source. It is expected to raise the working

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temperature which would lead to higher efficiency. The efficiency was calculated by the formula

$$\eta_T = \eta_{TD}^N \qquad (1)$$

where η_{TD} is the thermodynamic efficiency of the motor and N denotes the lowering in efficiency as a result of heat losses; η_T was calculated for the case of optimum ratio M of load resistance to thermogenerator resistance. A graph shows the dependence of η_T on z. A table gives the values of α, ρ, $\varkappa$, η, z and zT_{max} (T_{max} being the highest possible temperature of the hot joint) for the following refractory compounds of transition metals: $MoSi_2$, CoSi, $NbSi_2$, ReSi, CrN, NbB_2, TiC, MnSi, $MnSi_2$,

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